

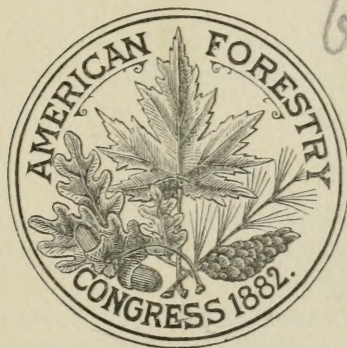
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PROCEEDINGS

OF THE

AMERICAN FORESTRY CONGRESS



Volume 7

AT ITS MEETING HELD AT ATLANTA, GA., DECEMBER, 1888.

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NOTE.—The American Forestry Congress, whether inviting persons to read papers from its platform or publishing those papers afterwards in connection with its proceedings, is not to be understood as endorsing the views expressed or adopting them as its own. The Congress offers its platform, in a liberal spirit, for the purpose of promoting a free and full discussion of all questions of importance connected with the subject of Forestry.

The Committee of Publication regret the delay which has occurred in presenting the transactions of the Congress to the public in the present form.

NEXT MEETING.

The next meeting of the American Forestry Congress will be held at Philadelphia, in Horticultural Hall, beginning on Tuesday evening, October 15th, 1889, and closing on Friday evening, October 18th.

All persons desiring to present papers should notify Mr. Herbert Welsh, Chairman of the Local Committee on Speakers, 1305 Arch street, Philadelphia, or Mr. J. B. Harrison, Corresponding Secretary, at least two weeks before the time of meeting.

WASHINGTON, D. C., *June 21, 1889.*

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OFFICERS.

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J. D. W. FRENCH, Boston, Mass.

CHARLES MOHR, Mobile, Ala.

HERBERT WELSH, Philadelphia, Pa.

GEORGE PARSONS, Denver, Col.

Recording Secretary, N. H. EGLESTON, Washington, D. C.

Corresponding Secretary, J. B. HARRISON, Franklin Falls, N. H.

Treasurer, H. M. FISHER, Philadelphia, Pa.

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Committee on Legislation—N. H. EGLESTON, Washington, D. C.

E. T. ENSIGN, Colorado Springs, Col.

H. M. FISHER, Philadelphia, Pa.

HERBERT WELSH, Philadelphia, Pa.

JOHN E. HOBBS, North Berwick, Me.

Committee on Arbor Day—B. G. NORTHPROP, Madison, Conn.

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ANNUAL MEMBERSHIP, \$2. LIFE MEMBERSHIP, \$100.

CONSTITUTION AND BY-LAWS

OF THE

AMERICAN FORESTRY CONGRESS.

ARTICLE I. This Association shall be known as the American Forestry Congress.

ARTICLE II. The objects of this Congress shall be the discussion of subjects relating to tree-planting; the conservation, management, and renewal of forests; the climatic and other influences that affect their welfare; the collection of forest statistics, and the advancement of educational, legislative, or other measures tending to the promotion of these objects. It shall specially endeavor to centralize the work done and diffuse the knowledge gained.

ARTICLE III. Any person may be elected a member of this Congress upon the recommendation of two members and the payment of two dollars. The annual dues shall be two dollars.

ARTICLE IV. The officers of this Congress, to be elected at the annual meeting, are as follows: President, five Vice-Presidents, Recording Secretary, Corresponding Secretary, Treasurer, and an Executive Committee, consisting of these officers and five members in addition.

ARTICLE V. The President shall preside at all meetings of the Congress in General Session, and deliver an annual address at the close of his term.

ARTICLE VI. The President, Vice-Presidents, Secretaries, Treasurer, and five other persons to be chosen annually, shall constitute an Executive Committee for the transaction of such business as may be required by this Constitution or by a vote of the Congress.

ARTICLE VII. The Recording Secretary shall keep a record of the proceedings of the Congress, and shall be custodian of all documents, books, and collections ordered to be preserved.

ARTICLE VIII. The Corresponding Secretary shall conduct the correspondence of the Congress.

ARTICLE IX. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Executive Committee.

ARTICLE X. The Congress at any regular meeting, or its Executive Committee in the intervals between its meetings, may appoint such local or special committees as may be deemed proper, and shall define their duties.

ARTICLE XI. The annual meeting of the Congress shall be in the month of August, September or October, or at such times and places as shall be determined by a vote in General Session or by the Executive Committee.

ARTICLE XII. At each annual meeting there shall be an election of officers for the ensuing year, and they shall remain in office until others are chosen. In cases of vacancies occurring in the intervals between the annual meetings they may be filled by the Executive Committee until others are selected. In case of absence of an officer at a regular meeting his place may be deemed vacant.

ARTICLE XIII. The officers of States, Territories, Provinces, or Local Forestry Associations, or their delegates, or the delegates of any Government, may participate in the proceedings of the Congress as Honorary Members.

ARTICLE XIV. This Constitution may be amended by a two-thirds vote of the members present at any annual meeting.

BY-LAWS.

1. Papers or abstracts of papers to be read must be sent two weeks before any meeting, for classification, to the Corresponding Secretary.

2. The following classification of subjects is adopted for the reading of papers:

Section A. Forest Planting, Forest Management, Forest Proper, Preservation of Forests.

Section B. Forest Economy, Technology, and Statistics.

Section C. Applied Science and Climatology, General Topics.

3. Contributors who are present shall have the preference in reading their papers.

4. Any member shall be entitled to the privilege of using any books or documents, not of record, at the discretion of the Recording Secretary.

PROCEEDINGS OF THE SEVENTH ANNUAL MEETING

OF THE

AMERICAN FORESTRY CONGRESS.

CLEVELAND, OHIO.

The Seventh Annual Meeting of the American Forestry Congress was held *pro forma* at Cleveland, Ohio, on the 16th day of August, 1888, and adjourned to meet at Atlanta, Georgia, on the 5th day of December following.

ATLANTA, GEORGIA, *December 5, 1888.*

The American Forestry Congress met this day at Atlanta, Ga., in the Hall of Representatives, at 3 o'clock P. M. It was called to order by the President, Hon. C. R. Pringle, and opened with prayer by Rev. James Poindexter. The Congress was hardly organized when a committee from the Southern Forestry Congress, then assembled in the Senate Chamber, Atlanta, appeared and presented the following resolutions, which had been adopted by that body:

Whereas it is important to the success of forestry interests that efforts for this cause should be concentrated, be it

Resolved, By the Southern Forestry Congress, That application be and hereby is made to the American Forestry Congress for permission to merge this Association and add its membership to theirs.

Resolved, That hereafter there should be only one general association or forestry congress, and that organizations in the several States having this great public benefaction in charge are requested to correspond and unite with the American Forestry Congress.

On motion, the following resolutions were immediately adopted:

Resolved, That the request of the Southern Forestry Congress for union with this Association be acceded to, and that the members of that Association be, and they are, hereby elected members of this Association.

Resolved, That a committee of five be appointed by the President to notify the Southern Forestry Congress of this action, and to invite its members to unite with us at once and participate in our proceedings.

The President appointed as the Committee of Notification Messrs. N. H. Egleston, Geo. W. Minier, J. D. Lyman, Thos. D. Edge, and Leo Weltz. The Committee attended to the discharge of their duty at once, and returned with the announcement that the members of the Southern Forestry Congress would join this body immediately.

A few minutes before four o'clock the members of the Southern Forestry Congress entered the hall where the American Forestry Congress was sitting. Their appearance was greeted with hearty applause, and a cordial address of welcome was made by the President.

THE UNITED CONGRESS.

The first business transacted by the joint body was the appointment of the following Committee on Credentials: Messrs. E. T. Ensign, N. H. Egleston, and G. H. Waring.

A Committee on Business was appointed, consisting of Governor Bullock, Major S. Root, and Hon. B. E. Fernow.

DELEGATES PRESENT.

The delegates to the joint assembly were :

Alabama—Charles Mohr.

Connecticut—W. D. Smith.

Colorado—Hon. Edgar T. Ensign.

District of Columbia—Gen. A. W. Greely, B. E. Fernow, N. H. Egleston.

Florida—Mrs. Ellen Call Long, Mrs. Mary Stockton Young, Hon. D. F. Hammond, Hon. B. J. Shipman, Hon. W. Curry, Hon. W. C. Zimmerman, Colonel N. Fitzgerald, Hon. George W. Wilson, Hon. Wm. James, Hon. D. U. Fletcher.

Georgia—Hon. C. R. Pringle, Major Sidney Root, Hon. R. B. Bullock, Hon. Nelson Tift, Hon. Theo. Schumann, Hon. R. J. Redding, Hon. B. D. Hardaway, Hon. G. H. Waring, Hon. Charles H. Smith, Dr. Samuel Hape, Hon. A. G. Haygood, and Hon. W. J. Northin.

Illinois—George W. Minier.

Kentucky—Hon. W. B. Macy, Hon. A. H. Logan, Hon. W. T. Knott, Hon. T. T. Garrard, Hon. A. M. Braun.

Massachusetts—J. D. W. French, Nathaniel T. Kidder.

New Hampshire—J. B. Harrison, Hon. John D. Lyman.

Ohio—Hon. Leo Weltz, Rev. James Poindexter.

Pennsylvania—Hon. Thomas J. Edge, Hon. J. S. Trexler, Hon. H. F. James, and Miss Mary B. Coulston.

South Carolina—Hon. John Lawton, Dr. T. J. McKee, Hon. Geo. F. Atkinson, Hon. G. H. Gramling, Hon. J. A. Gramling.

Professor S. J. Rauner, of St. Petersburg, Russia, and Judge J. G. Henderson, of Georgia, were invited to participate in the proceedings of the Congress.

The Corresponding Secretary, Mr. Fernow, read his report, as follows :

REPORT OF THE SECRETARY.

The past year has been among the most fruitful in the work of our Association, and may well be termed the crisis in its existence. It seems that the propaganda which we have carried on for now six years is beginning, if not to bear fruit exactly, yet to show the fruit blossoms which carry the promise finally of a useful harvest.

The interest in our work has increased everywhere and has manifested itself in all parts of the country from Maine to California. As I shall be able to show you more particularly by the report of our New England Committee, there will be held in Maine within two weeks a large Forestry Convention, called not by "forestry cranks," but by solid substantial business men and lumber men, for the purpose of determining a policy for that State.

This week in New York the Academy of Sciences devoted one of their meetings to the forestry problem, and I understand that the revival of the New York Forestry Association is being prepared for this winter, while the Adirondack Forest Commission, although for various reasons it has not accomplished what might have been expected, is still striving to put into practical operation some of our demands.

The Pennsylvania State Forestry Association, inaugurated about two years ago, has prospered in membership and influence, and, with the sympathy of her Governor to aid, has succeeded in having a Forest Commission appointed to formulate the necessary forest laws for the State.

"Forest Leaves," the little publication of the Pennsylvania Forestry Association, has become a useful means of keeping the interest in the State alive, and in regard to it I shall further on recommend the action of this Congress.

Michigan, the great lumbering State, has also awakened this year to action with regard to her forest interests, and has created a Commission for the purpose of determining a policy for the State.

Illinois, after our Springfield meeting, fulfilled the object for which we meet by concentrating her interests in forestry in a State Forestry Association.

Kentucky has joined this year the number of States which think that their forestry interests need looking after. I was also present at the first occasion on which Tennessee, during her first Chautauqua, chose to present the subject to her people, by invitation of her Governor.

Texas has seen fit to inaugurate a Forestry Association. Colorado, under her enthusiastic and assiduous Forest Commissioner, is developing a forestry system for her needs.

From California I have reports which speak of the interest in forestry matters as an infection that has taken hold of the people in all parts of the State.

The report of the Arbor-day Committee, the assiduous chairman of which, Dr. Northrop, of Connecticut, is unfortunately prevented by an accident from being here, will show that the educational value of this institution is now recognized in almost every State.

May we not take at least some credit and pride of our propaganda for these results? Even if the direct influence of this Congress may not be recognized in all these manifestations of interest in forestry matters, the indirect influence exerted through the work of years before will not be denied.

Speaking now of the work of this Congress during the year since its last meeting, the principal effort has been to impress that body of men who are the least impressionable of any, the National Congress, with the necessity of responding to the requirements of our national timber interests.

While in former years the attempts to produce effects between the meetings were of a desultory and uncertain character, we have this year for the first time worked for one definite purpose: and although the result has not been equal to the exertion, as it rarely is in the world of politics, we have thrust the first spade into the ground for digging the foundation for our National Forest Department.

Mr. Egleston, from the Committee on Legislation, will give you a history of these attempts to impress Congress.

The bill for an administration of the National timber-domain which I presented to you at the Springfield meeting was subsequently considerably modified in its details and introduced in both Houses.

Petitions were sent out and campaign papers, of which I have sets for your use at this meeting, were distributed, and newspapers helped the measure along by favorable comment.

If we did not succeed in getting even a satisfactory consideration of our propositions, this was not our fault.

That we struck a stone in our first thrust of the spade need not discourage us from continuing the digging. I may remind you that it took fifteen years to pass the Interstate Commerce Bill. There is still hope that a Forest Administration may be inaugurated before the national forest domain is all disposed of.

The Congress for the first time also participated in an exhibition, embracing an opportunity for impressing certain facts upon a throng of people who would congregate at such an exhibit. I had prepared and sent to the Cincinnati Exposition a chart, giving in large type and brief language an account of the condition of our forestry interests. There was also sent to the Exposition the section of a tulip tree, with the annual rings marked, and corresponding to these there was attached an historic chart, which Mr. Egleston prepared at my request, showing the prominent incidents of history through which this tree had lived since the time of Queen Elizabeth's accession to the throne. In this manner the mind of the beholder was strikingly impressed with the length of time which it took to grow the forest which we now wastefully squander. A third exhibit, which was connected with these two, consisted in the model of a tree-planting machine, capable of planting twenty to thirty thousand trees per day, which promises to revolutionize forest planting on the prairies.

I come now to the internal working of the Congress. At the last meeting I consented to act once more as Secretary of your Association, on the condition that an improvement in the financial aspect of its affairs should be effected. Consequently a Committee on Finance was formed, consisting of the two Secretaries and the Treasurer. A circular letter was sent to the members, many of whom were in arrears, asking them to pay up their dues, or by paying \$10 in lieu of all dues to become life members. At the same time it was proposed that the \$10 life-membership should after this be discontinued, and the collection of a Permanent Fund attempted by creating Patronships at \$100 each, the subscriptions to which should not be called for until 100 such patrons were found. Although members were especially requested to interest themselves in advancing this proposition by asking those of their friends who, although lacking the time to aid our cause with their personal attention, should be able to contribute from their pocket towards its success, the result has so far been meager. There have been so far received only eight obligations for Patronships. The names of those who have obliged themselves to contribute to this fund, under the condition that one hundred could be found to assume a similar obligation, are as follows: Joseph S. Fay, of Massachusetts; Abbot Kinney, of California; Morris K. Jessup, of New York; A. A. Moss, of Philadelphia; Albert Lewis, of Bear Creek, Pa.; Hon. C. R. Pringle, of Georgia; Martin Conrad, of Chicago; B. E. Fernow, of Washington.

The fact that four of the officers of the Congress appear in this short list might inspire confidence in the ultimate success of their canvass.

Twenty-eight of the old members availed themselves of the privilege of becoming

life-members, so that the number of life-members is now seventy-one. One life-member, the celebrated Dr. C. R. Agnew, of New York, died during the year. His loss is to us of special moment, for the reason that he was one of those who spontaneously, without any solicitation, joined our ranks from conviction of the value of our work.

The collection of members' dues and initial fees yielded \$122. Fifty-six members resigned, five of whom paid up their arrears; eighty-nine members were dropped, including all of those in arrears for two years; to these must be added five whose addresses cannot be found, leaving active annual members thirty-two, or altogether, with life-members, a roll of one hundred and three members.

In addition, I have to record a donation of \$25 from Mr. Joseph S. Fay, of Woods Holl, Mass., being the fifth donation made by this Nestor of practical forestry in the United States. I do not need to sing his praises, which the pine trees he planted will sing to those who come after him. The unbounded faith of this gentleman in the ultimate success of our work should induce others to aid it substantially as he has done to hasten its progress.

The expenditures, as usual, have been for printing mostly, and for stationery and postage, as none of the officers of the Congress receive pay or even have their expenses refunded.

The expenditures which are detailed in the Treasurer's account amounted to \$217.24, and the balance remaining on hand, \$275.01—a better balance than we have ever had before.

As I am about to retire from the stewardship of the affairs of this Congress, which have been entrusted to me for the last five years, I have thought it of interest to review, in a condensed form, the cost by which we have accomplished, whatever it may be, in creating a proper sentiment for forestry in the country.

I find that the total collections of the Congress, during the six years of its existence, amounted to \$2,118.80. This amount was made up by \$1,696 of membership fees, dues, and life-memberships, in which 274 members at different periods participated. Three men made donations to the amount of \$135; ten men raised a publication fund of \$195. Sale of publications and advertisements yielded \$112.80.

The total expenditure during these six years was \$1,841, of which for printing was paid to the amount of \$1,220.84; stationery required \$200.76; postage and express charges consumed \$303.25; while \$119 was paid for stenographers, clerk-hire, and sundry expenses.

It should be mentioned, however, that the expense of the first two meetings, in Cincinnati and Montreal, were mostly paid for by private funds outside of those of the Society.

It will certainly not be charged that the Congress has accomplished its work at a heavy expense. Economy has been the watchword in the expenses of the Congress, as it is the aim of the reform for which we are striving. This economy necessarily has retarded the work, but I am not prepared to find fault with the slow progress. There is a time in matters of economic reform when the people are ready to acknowledge its need and then will grapple with it. Often the efforts to produce a premature solution prove abortive; the powder is wasted too early in the action, and those who storm the fortress may have to abandon it again for lack of ammunition.

As the people get educated to understand the question which we place before them, they learn how to answer it. This education is the object of this Congress, and you know that educating is different from cramming; it requires time.

During the existence of the Congress we have held nine meetings, namely: besides the large initial meeting in Cincinnati in April, 1882, and an extraordinary meeting in Washington city, seven annual meetings in Montreal, St. Paul, Saratoga, Boston, Denver, Springfield, Ill., and Cleveland; the last was a formal meeting, which was adjourned to the present meeting in Atlanta in order to satisfy the requirements of our Constitution, which demands that the annual meeting shall take place in August, September, or October.

The papers read at Cincinnati were published in various ways. Those of the Montreal meeting were printed in a special edition by the *Montreal Herald*. Through the courtesy of the Canadian government we were enabled for the first time to present in volume form the papers read at St. Paul.

The best papers read at Washington were published in a pamphlet by the Department of Agriculture. Those read in Saratoga and Boston were by a special effort printed in a volume which will rank favorably with any forestry publication in this country.

For the meetings at Denver and Springfield we have only been able to secure separate prints of the reports as they appeared in the local newspapers, and several good papers remain unpublished.

There were also published in 1884 three bulletins—a tentative beginning to see whether a periodical forestry publication of moderate size was desirable.

Besides these publications and the campaign papers mentioned before, the calls for

the meetings were of such a nature, setting forth the character and methods of our reform movement, as to induce their reprint and editorial comment in many newspapers: and thus the indirect influence exerted by our meetings was accomplished, while the direct influence upon the communities where we met has invariably borne results in advancing favorable legislation, formation of local forestry societies, and spreading interest in the subject among the people of the State.

We have done the pioneer work, and now let us hope that a new era opens with this meeting.

The readiness with which the Governors of several States have responded to the invitation to send delegates allows us to expect that there is in every section of the country an intelligent conception dawning that the recommendations of forest management and forest preservation are matters not simply for the theorist, the enthusiast, and the crank to talk about, but for the statesman, economist, and landed proprietor and practical man to act upon.

In laying down at this meeting my position as your Secretary, allow me to say that I have at all times acknowledged my incapacity to advance the interests entrusted to me as they ought to be advanced, but I do claim for myself and for all those who have initiated this movement and kept it alive in spite of many drawbacks, opposition, and lack of interest—I claim that we have been the plowmen faithfully preparing the ground and keeping it in condition for those that shall sow the crop and reap the harvest.

Let us hope that with the new era, which I predict, the right sower will be found to crop the ground which we have plowed.

After the reading of the report the Congress took a recess until evening.

There was a good attendance at the evening session. Rev. Dr. Tucker opened the meeting with prayer. Governor Gordon, who was to deliver the address of welcome, being unavoidably absent, Hon. A. S. Clay, Speaker of the House of Representatives, was invited to welcome the Congress. Mr. Clay said:

LADIES AND GENTLEMEN OF THE AMERICAN FORESTRY CONGRESS: I noticed in this morning's *Constitution* that the Southern Forestry Congress and the American Congress would convene at 7.30 o'clock in the House of Representatives, and that addresses of welcome would be delivered by Mayor Cooper on the part of the city, and Governor Gordon on the part of the State. I am sorry to say to the Forestry Congress that our distinguished Governor sent for me to-day and informed me that owing to a serious throat trouble he could not be present this evening, and asked me to make this statement to your honorable body and to make a few remarks of welcome to your distinguished Association. I exceedingly regret that you will be deprived of the privilege of being entertained by our Governor. But let me say in his behalf and in behalf of the State of Georgia that every association or society that has for its object the material advancement of our common country always finds a hearty welcome in the homes of Georgians. It should, indeed, be gratifying to the people to see so distinguished a class of citizens banding together with no other purpose than to build up and advance the interests of our country. Georgians have felt the need of your Association. We need no scientist to tell us that the overflow of our streams, the washing of our soil to the great detriment of our farming interests, are caused largely by the wholesale and indiscriminate destruction of our forests. I understand it to be the object of your Association not only to inculcate the importance of the existing forests, but to impress upon the people the importance of planting out trees that future generations may reap the benefit of your labors. The State of Georgia encourages the importance of your mission, and extends to you a hearty welcome. Yes, ladies and gentlemen of the American Forestry Congress, we throw open our doors, we introduce you to our citizens, and welcome you to our State.

In the absence of Mayor Cooper, who was to welcome the delegates on the part of Atlanta, Major Sidney Root, in a few witty and appropriate words, extended the hospitality of Atlanta to the visiting delegates.

The addresses of welcome were replied to by Colonel C. R. Pringle. He said:

LADIES AND GENTLEMEN: After having received such words of welcome from the Speaker of the House of Representatives, in behalf of the State, and from Major Root, in behalf of the city, it is with pleasure that I express for this Congress our sincere thanks for the unbounded courtesy with which we have been received. We feel that it is no mean honor to be welcomed to this, the greatest city of the South, whose hospitality to strangers has already become proverbial.

And to the citizens of Atlanta I would say we feel honored at being your guests.

We think if there is a State in these United States whose hospitality would honor us, that State is your own beloved Georgia, for by her invitation we are here to hold this session, and by her Speaker of the House of Representatives we have been welcomed in his own royal style. Again thanking you for these courtesies, and with a deep sense of gratitude for your kindness, we will gladly accept your hospitality in being welcomed to Georgia and to Georgia's capital.

Mrs. Lollie Belle Wylie read a poem, appropriate for the occasion, composed by M. M. Folsom.

The President's annual address was then delivered by President C. R. Pringle. It gave in detail the aims and objects of the Congress; the past history of forestry laws and organizations, and also what the future had in store. It was quite lengthy, covering the ground thoroughly. He spoke with great hope of the future, noticing the growth of the forestry sentiment as an omen of good.

As this address has been published separately, it is not reproduced here. Copies may be obtained by application to President Pringle, Atlanta Georgia.

Upon invitation, General Greely, Chief of the United States Signal Service, made a brief address, reviewing his connection with the forestry industry. He closed with touching words, telling how he was grasped from the jaws of death in the far Arctic regions, and that returning home, next to once more meeting his loved ones, he welcomed the sight of the souglhing pines as they towered their heads to the blue sky. At the conclusion of his remarks the meeting adjourned.

PROCEEDINGS OF THURSDAY, DEC. 6.

The Congress met in the Hall of the Young Men's Christian Association at 9 o'clock, and was opened with prayer by Prof. Egleston.

A report of the Committee on Order of Business was read and accepted.

RECORDING SECRETARY.

In the absence of Mr. Bell, the Recording Secretary, Prof. Egleston was elected temporary Recording Secretary.

A letter was received from the managers of the Augusta Exposition inviting members of this Congress to attend the Exposition. In reply to it the following resolution was adopted: *Resolved*, That the thanks of this body are given to the managers of the Augusta Exposition, and that those members who can attend the Exposition are desired to do so in a body, and as representatives of this Congress.

A communication was received from Governor Gordon inviting the Congress to visit the new State capitol.

The Principal of the Public Schools invited the Congress to visit the schools and to participate in the exercises of Arbor Day on Friday. The invitation was accepted.

Letters of invitation were also received from President Bumstead, of Atlanta University, and from Spellman Institute.

Letters were read also from Gov. Oglesby, of Illinois; Hon. B. G. Northrop, Hon. J. H. Morgan, of Canada; John T. Best, Superintendent of Schools in Florida; Silas T. Fox, of the Agricultural Society of Pennsylvania, and Hon. J. Sterling Morton, of Nebraska, expressing their regret at not being able to attend the meeting of the Congress and testifying their great interest in its objects.

The letters were received with thanks, and the communication of Mr. Morton was ordered to be placed on the records.

LETTER OF MR. MORTON.

CHICAGO, Dec. 3, 1888.

DEAR SIR: Business affairs here compel me to remain and to deprive myself the pleasure of attending the Forestry Congress at Atlanta. My regret is all the more intense because I had meditated inflicting upon the Congress "The Biography of an Infant," and under that title to take up the history of the manufacture of lumber in the United States. It began in 1620, when the Puritans swung the first axes that felled the grand trees of our primeval forests, for the purposes of manufacturing boards out

of which to build the first civilized homes on this Continent. In 1797 the Government placed a tax, *i. e.*, a tariff duty for protection, on imported lumber of five per centum *ad valorem*. That was intended perhaps more for revenue than for protection, however. But in 1872 and in 1888 we find "the infant industry" of making lumber out of which to build human homes and marts and places of worship and schools protected by a tariff of \$2 a thousand feet board measure. What for? To shut out the products of foreign forests. To make lumber scarcer. To limit supply. To enhance artificially the price of lumber to those who wish lumber out of which to build homes, by shutting out the lumber of Canada. It kills competition from foreign forests. It guarantees the monopoly of the American market to the lumber lords of the Northwest, and compels the home-builders of the Northwest to pay those monopolists a high, artificial price for their forest products. When our Government thus pays a bounty of \$2 a thousand for the destruction of forests, what can forestry do or a Congress of Forestry accomplish to delay devastation?

The Government offers a bounty, first, for the denudation of our woodlands. Then, with singular inconsistency, another bounty of 160 acres of land, under the Timber-Culture Act, for the planting and maintenance of a mimic forest of ten acres.

Lumber should be admitted to the United States *duty free*. That would increase our supply. Demand remaining the same, it would lower lumber prices, and conserve our timber-lands.

The U. S. Senate Tariff Bill now pending proposes to leave the tariff on lumber, but it kindly puts acorns on the free list. This is "a step towards" free lumber. It is the only encouragement for forestry so far given. Three or four hundred years hence, if we all plant our untaxed acorns, we shall have demonstrated among our own graves the verity of "Tall oaks from little acorns grow."

Perhaps it is ordered that the race shall destroy forests forever, and never restore forests. The Holy Land, all the desolate Orient, once glorious in forests, luscious in fruits and fragrant in flowers, recites man's improvident and wicked waste of trees.

The lesson should teach America. It, when translated to the understanding, is only a picture of our future if we also destroy, seldom conserve, and never plant great forests. What came to the axemen of the Orient will come to those of the Occident. The same causes give inexorably the same results.

It is possible that the Mound Builders were destroyers of forests and that their race perished with the trees. Then there was a long period, eons upon eons, which no man hath any knowledge of, during which Nature reforested this Continent from the Atlantic to the prairies of the Northwest. It may be that the life of a race of men is limited by the duration of the forest or woodland area which they encounter at the beginning of their career?

But I did not intend so long a letter. It is written hastily (in the office of my son, Paul Morton), but it is none the less sincerely zealous in behalf of any and all measures which may conserve or increase the forests of our common country. We use 25,000 acres of woodland as to their forest products every day. In 28 years we shall have consumed all of the forests in the United States. It is time to plant generally and thoughtfully. With the forests all dead and gone, man will not long survive on the American Continent.

Yours,

J. STERLING MORTON.

To President PRINGLE,

American Forestry Congress, Atlanta, Georgia.

COMMITTEE ON RESOLUTIONS.

A Committee on Resolutions was appointed, consisting of Hon. Edgar T. Ensign, of Colorado; Hon. W. T. Knott, of Kentucky; Hon. Geo. W. Minier, of Illinois; Gov. Rufus B. Bullock, of Georgia; Mrs. Ellen Call Long, of Florida; Hon. Chas. C. Binney, of Pennsylvania; Hon. Thomas D. Edge, of Pennsylvania; Hon. J. D. W. French, of Massachusetts; Hon. J. B. Harrison, of New Hampshire.

REPORTS.

The Committee on Legislation, through its chairman, Prof. Egleston, reported in regard to the efforts of the Committee to secure the passage of the bill for the protection and management of the public timber lands prepared by this body at its last meeting. The report was as follows:

REPORT OF THE COMMITTEE ON LEGISLATION.

THE FORESTRY BILL BEFORE CONGRESS.

Feeling that the public mind had become sufficiently informed upon the subject of forestry to warrant an appeal to the General Government for some efficient action for

the preservation and proper management of the public timber lands, and that such action was imperatively needed for the welfare of the country, this Congress, at its meeting a year ago in Springfield, Illinois, devoted a large portion of one of its sessions to the consideration of the subject. The Corresponding Secretary presented to view the forestry legislation which had been proposed or carried into effect hitherto in the several States, and read sundry bills on the subject which had been proposed. He read also a bill which had been prepared by himself in consultation with others, entitled "A Bill for the Protection and Administration of the Forests on the Public Domain." The bill was discussed at length and was finally adopted for presentation to the National Congress, and a committee was appointed for the purpose of laying the bill before that body and securing, if possible, its passage.

In endeavoring to discharge the duty then intrusted to them the committee presented the Memorial and Bill to both Houses of Congress in the first business days of the last session. A more deliberate consideration of the bill than could be given it during our meeting at Springfield having revealed some defects in it which were not then apparent, your committee regarded themselves as only acting in the spirit of their instructions from this body in making sundry modifications in the bill as originally prepared and presented for your consideration, modifications designed to make the bill more effective for its purpose, while at the same time calculated to obviate hindrances to its passage. The Memorial, as presented to the National Congress, was as follows.

MEMORIAL OF AMERICAN FORESTRY CONGRESS AND OTHER CITIZENS TO THE 50TH
CONGRESS U. S. A.

To the Senate and House of Representatives in Congress assembled:

Your memorialists, the American Forestry Congress and citizens of the United States, respectfully represent:

WHEREAS, The present laws in regard to the public lands, so far as they relate to the disposal of timber lands, or of the timber from the same, are entirely inadequate to the requirements of the present state of our civilization; are unreasonable, pernicious and prejudicial to the best interests of this country, and have a tendency to induce fraud, theft and perjury;

WHEREAS, Especially in the Rocky Mountain and Pacific Slope region, the mining interests in regard to material supplies, and the agricultural interest in regard to a favorable distribution of water supply, are threatened with danger, or have already been endangered, by the thoughtless and unnecessary destruction of the forests and bush lands on the mountain slopes and hill-sides;

WHEREAS, By axe, by the teeth of cattle and by fire, many millions of dollars worth of public property have been destroyed without benefit to any one, owing to the neglect on the part of the Government to protect the property of the people;

WHEREAS, Favorable, agricultural and climatic conditions of a country are largely dependent upon a proper amount of well distributed forest areas, and especially upon the preservation of the forest cover on the mountains;

WHEREAS, Such preservation cannot be had under the existing laws, nor can be expected at the hands of private individuals;

WHEREAS, By the disposal of the timbered areas now in the hands of the United States, and by their devastation under the present conditions, the power to insure proper forest legislation passes from the people:

Therefore, The undersigned memorialists, imbued solely by a desire to further the best interests of the country at large, most respectfully and urgently pray that you will, without delay, give consideration to and enact as a law the subjoined Bill, which provides for the withdrawal from entry or sale, classification and proper disposal or administration of public forest lands, or that you provide such other legislation in the same direction as may appear best to your honorable body.

Meantime the Committee had also sent copies of the Memorial and Bill to persons in all parts of the country, asking their signatures to the same as memorialists, and the return of the papers, when signed, to the Committee. These memorials or petitions, when thus received, were placed from time to time in the hands of various Senators and Representatives, to be presented to the two Houses of Congress with the view of thus bringing the bill and its subject afresh to the minds of the members, and indicating to them the wide-spread interest taken in the subject by the public at large.

The bill was referred, in the House of Representatives, to the Committee on Public Lands, and in the Senate to the Committee on Agriculture and Forestry. But your Committee, not content with thus presenting to Congress the above-mentioned memorials in support of the bill, sought to obtain additional influence in favor of it by means of the following Circular, which was addressed to influential persons in various parts of the country.

[Circular.]

AMERICAN FORESTRY CONGRESS,
WASHINGTON, D. C., January, 1888.

DEAR SIR: The American Forestry Congress, feeling the urgent need of the speedy action of the Government for the protection and proper management and disposal of the public forests, adopted at its recent annual meeting a Memorial to Congress on the subject, and accompanied it by a bill for an appropriate public act.

The need of some such action as is contemplated by the bill cannot be overestimated. The facts which show that need are briefly but sufficiently indicated in the inclosed memorial itself and in the accompanying slips. These and other facts relating to the subject have been published so extensively during the last few years, and have made such an impression upon intelligent persons throughout the country, that, if the feeling of such persons can be properly made known to the National Congress now in session, there seems a reasonable probability that some appropriate legislation may be secured.

The Committee to whom the Forestry Congress has given charge of its Memorial, recognizing you as one interested in the subject, earnestly request you to address a personal letter at once to your Senator or Representative in Congress, or both, urging them to use their influence to secure, at the present session, the passage of the bill proposed by the Forestry Congress or one of similar import.

In behalf of the Committee.

Very respectfully yours,

N. H. EGLESTON.

The chairman of your Committee, together with your Corresponding Secretary, who was indefatigable in his efforts to secure the adoption of the bill, had repeated interviews with the Committee on Public Lands, and also with the chairman of the Senate Committee. They had interviews also with other members of Congress, as opportunity offered, in which they endeavored to create a favorable interest in the bill. Such assurances of sympathy with the general features of the bill were given by members of the Public Lands Committee, that we were hopeful for a time that it would be favorably reported to the House of Representatives. That Committee, however, we soon found, had undertaken to formulate a bill embracing the whole matter of the disposal of the public lands, and designed to take the place of the existing timber-culture and pre-emption acts. In the final adjustment of their bill they engrafted upon it some features of our bill, but left out some of equal importance, while they failed to make any adequate provision for the efficient execution of the enactments of the bill, so far as they were related to the preservation or regulation of the public forests. We protested against this inadequate and really impracticable treatment of the subject. We called the attention of the public also to the defects of the Committee's bill, and, at our suggestion, protests against its passage and petitions for the adoption of our bill in its place were made by many editors of newspapers and other persons of influence, as well as by several organized bodies. The Pennsylvania Forestry Association, which from the first had given us its aid, now joined heartily in the endeavor to prevent the passage of a bill which, instead of promoting the interests of forestry in our country, was calculated, by its mere semblance of doing something, to defeat our object and to prevent, for an indefinitely long period of time, further and most desirable legislation. The Association used all its influence in co-operation with our endeavors to secure the passage of our bill. But all the urgency that could be brought to bear upon the subject was not sufficient to induce the Committee to make our bill in its entirety a part of their own, or to report it as an independent measure. Had our bill shown a political aspect or a tendency to promote the pecuniary interests of any considerable number of persons; if it had been a scheme to take money out of the public treasury instead of being a measure for husbanding and increasing the public wealth, doubtless we should have received more consideration; but having no partisan or pecuniary advantage with which to appeal for support and aiming only at the general welfare, our bill was not allowed a hearing outside of the Committee-room. In the Senate it did not even get the consideration of the Committee to whom it was referred. We had one brief conference with the chairman of the Committee and were promised a hearing by a sub-committee, and days were assigned for the purpose, but the hearings did not take place. During the unprecedentedly long session of nearly ten months no adequate consideration was given to our memorial and bill, supported though they were by the petitions of eminent men and public bodies in various parts of the land.

Such is the by no means pleasant report which your Committee are obliged to make in regard to the result of their endeavors to discharge the duty imposed upon them by your appointment. All which is respectfully submitted.

NATHANIEL H. EGLESTON,
EDGAR T. ENSIGN,
HENRY M. FISHER,
WARREN HIGLEY,
JOHN E. HOBBS,

Committee.

The thanks of the Congress were given to the Committee.

The New England Committee reported through Hon. John E. Hobbs, of Maine, as follows:

REPORT OF THE NEW ENGLAND COMMITTEE.

In response to the communication of your worthy and efficient Secretary, asking for a report of the Committee for New England on the state of affairs and prospects in New England, Mr. John E. Hobbs, one of that Committee, gives the following statement of facts concerning Maine, where the forestry problem which your distinguished body is so effectually forcing upon the consideration of the American people, is now engaging the attention of thoughtful men throughout the State, as never before.

This hopeful state of things is largely due to the influence of the Boston meeting of the American Forestry Congress in Sept., 1885, and to the efforts of the Committee. These have been directed chiefly toward the best means of preventing forest fires by State legislation and by influencing public opinion through the public press.

The Maine State Grange, embracing a membership of more than 15,000 farmers, has heartily aided the Committee in carrying forward this work. Through their united influence the Legislature, at its last session in 1886, was induced to establish an annual Arbor-day, although certain other legislation recommended by them failed of enactment. The discussion of the subject, however, in the Legislature and in the newspapers, together with the action taken by the State Grange, has served to create a widespread interest in the general subject of forest protection, which may result in the enactment of judicious laws by the next Legislature.

At its annual meeting at Skowhegan in December last, the State Grange adopted, by an unanimous vote, the report of its Committee on Forestry, which report, among other things, recommended the adoption by that body of the Memorial of the American Forestry Congress to the Senate and House of Representatives in Congress assembled, and that the State Master and Secretary sign the Memorial in behalf of the State Grange and forward the same to Congress.

This Memorial, with the accompanying bill, was presented in the Senate by Senator Hale of this State, who takes a deep interest in the subject, and it was upon his motion referred to the Committee on Agriculture of the Senate.

As an evidence of the great public interest already developed with reference to the necessity of devising some method for checking the wanton destruction of forest growth by the careless setting of fires, and for encouraging the planting and cultivation of valuable forest trees on the thousands of square miles of land now lying waste and worthless for any other use, a "call" for a State Forestry Convention, to meet at Bangor December 18, is subjoined as a part of this report. This "call," which was drawn up by Hon. George F. Talbot, of Portland, and is well worthy of perusal, has been signed by many of the largest owners of timber lands and manufacturers of lumber in the State; also by many of the most prominent business men, besides by many others who have a national reputation. Among the latter are the venerable ex-Vice-President Hamlin, ex-Governors Robie, Connor, Davis, Plaisted, Dingley, Gov. Marble, Governor-elect Burleigh, U. S. Senator Hale, Hon. Wm. L. Putnam.

The meetings of this Convention are to be held in connection with those of the State Grange, which meets at Bangor at the same time. This will be one of the most notable gatherings ever held in the State, and it is to be hoped that its influence will extend far beyond its bounds, even from ocean to ocean and from the Gulf to the utmost tree limit of our Northern neighbor.

JOHN E. HOBBS.

NORTH BERWICK, ME., Nov. 28, 1888.

Perhaps nothing would now contribute more to the growth and prosperity of our State than a restoration of its forests. With a rugged soil, requiring hard and prolonged labor to fit it for treatment by the plow and the mowing-machine, under a severe climate that gives us short and precarious summers and early frosts, Maine competes at disadvantage with the prairie States in all agricultural productions except hay, oats, and potatoes. Its lack of coal and iron, its distance from markets, and its inadequate food-supply are serious impediments to the prosecution of all branches of manufacture except those which its own fisheries, forests, and quarries support.

It was the extensive, almost unbroken, forest of Maine that first attracted enterprising people to settle it and make it their home. It was by marketing our forest products, and the shipbuilding and commerce thus developed, that our people mainly acquired the wealth which they have expended in clearing lands, building roads and railroads, dwellings and factories. The unnatural emigration to other States, and the arrest in the rapid early growth of our own, must, we think, be chiefly attributed to the shrinkage and destruction of our forests and the disastrous effect this destruction had had upon all the productive industries of our people.

Those, however, who have most carefully studied the problem, do not attribute this shrinkage and loss of the tree growth to the annual cutting for sale of merchantable timber and fuel. They believe that under such operations, prudently conducted, our forests might not only hold their own, but actually become, from decade to decade, more valuable. The great and general loss has come about from sweeping fires, carelessly set or not promptly arrested, and from a thriftless management, which a wiser public sentiment, reinforced by judicious laws, might have prevented.

It is not yet too late to arrest the process of devastation, and the restoration of nearly the original breadth of our arboreal acreage would be so aided by favorable conditions of climate as to require but little, if any, sowing of seeds or planting of young trees. It is believed that two-thirds of the surface of Maine might be devoted permanently to the growth of timber and that there would be ample acreage left for all the cultivation and pasturage the most successful development of agriculture could demand. So to utilize the thousands of square miles of rocky, hilly, and swampy lands in our State would promote and not restrict agriculture by enhancing the prices of these products of our soil and climate, which the lumbermen consume, and by moderating the tendencies to long-continued droughts; it would aid manufacturing by making more equable the flow of streams that supply their propulsive power; and it would stimulate commerce and shipbuilding by largely increasing the product of a bulky article of exportation, always sure of receiving a remunerative price.

The undersigned, believing that it is highly expedient to direct public attention to the urgent necessity of doing whatever wise and combined effort may be able to do to prevent and punish the destruction of woods by the careless setting of fires and to encourage the planting and preservation of timber trees, respectfully invite their fellow-citizens throughout the State who are interested in the general subject to meet at — in Bangor, on Tuesday, the 18th of December next, at two o'clock in the afternoon, for the purpose of discussing the question of the forests in their relation to the general industries of the people, of listening to addresses upon the subject by persons who have made it a special study, and of deliberating upon and recommending such acts of legislation as may be deemed necessary to encourage the planting and preservation of timber trees, and to lessen the danger of their destruction by careless fires or wanton trespass.

Informal reports from the States and Territories represented in the Congress were now called for.

Mr. J. D. Lyman, of New Hampshire, said the forests in that State had decreased to no great extent. Sixty per cent. of the State is now in forests.

Mr. J. D. W. French, of Massachusetts: This State stands with New Hampshire in extent of her forests; has \$1,380,000 of wood land, but little decrease. There are 1,000,000 acres of land in the State good for nothing but tree planting. We have laws for protection of forests against fires. Mr. French said that he received a \$1,000 premium, for raising forest timber, from the Society for the Promotion of Agriculture. Arbor Day is observed. "We have exemption laws from taxation on forest lands under certain circumstances. The State has a society for the promotion of all agricultural interests." Mr. French, in closing, expressed his pleasure at being present at a union meeting between the North and the South and said that the first friendly handshake he received was from a South Carolina delegate.

Mr. Walter D. Smith, of Connecticut: "The question of forestry should be brought in with common-school education. Children can be more easily interested and instructed than older persons."

J. B. Harrison, of New Hampshire, reported for Vermont: "The area of forests is not decreasing as rapidly as would be supposed. There is a deterioration of tree producing land. Attention to forestry in detail is needed. Much harm is done by fire."

No delegate was present from New York, but Mr. W. H. Hale, a press representative, said: "Albany was at one time one of the greatest lumbering marts in the United States. A law is in force against lumber speculation. Arbor Day is observed. The press of the State is in sympathy with the forestry interests."

Thomas D. Edge, of Pennsylvania: "Many forest laws are in force, and Arbor Day is observed. The government and forestry organizations are willing to act, but are in darkness as to the definite course to pursue. Mr. C. C. Binney was present, sent by the Forestry Association of Pennsylvania to watch and gain information from this

Congress in regard to the passage of laws relative to advancing forestry. He said that the association he represented was willing to act but did not know what to do. They have been instrumental in furthering the observance of Arbor Day.

District of Columbia: Gen. A. W. Greely spoke for the United States at large. No question, he said, is of more vital interest than this. It is difficult to impress upon the people the importance of planting trees, when they are springing up around them. Few are willing to sacrifice the present for the future. The authorities in Washington should bring the importance of the subject before the people. Much can be learned from Europe on the subject. They have for years observed forestry laws.

Mr. Fernow also spoke briefly, directing his remarks to the forestry laws of Europe and what we could gain from them.

Mr. Nelson Tift, of Georgia, said this was his first attendance at such an organization. The great question is how to protect and increase the woods. The use of lumber cannot be stopped, but the Government can check the fires by the passage of stringent laws. The Government is limited in its power over the property of individuals, and so the reason of land-owners must be appealed to. Around Albany, Ga., forests have been rapidly depleted. Much harm has been done by turpentine men.

Professor Glenn, of Jackson County, as he was obliged to leave the city, asked and was granted permission to read a paper. The paper held that much damage was done to soil by dead leaves and under-brush, and that to get rid of this the only way was to burn.

Mrs. Ellen Call Long, of Florida, said that the State was sadly without statistics on the subject. The people are greatly behind. The turpentine distilleries have been steadily injuring the woods, but still much is left. Arbor Day is observed, but in a sentimental rather than business-like way. Mrs. Long said she had prepared a paper in which she advocated burning, but that she was almost afraid to read it for fear of being unpopular with the Secretary—a remark which called forth some hearty laughter.

Dr. Mohr said of Alabama that nothing, so far, has been done to preserve and reproduce the trees. The evils of forest fires are making themselves manifest, and the need of legislation is becoming apparent. The introduction of dry kilns has done good.

Richard Choate, of Minnesota: The State is not all forest; much prairie land. Forests are being so heavily cut that the need of laws is manifested.

Dr. George W. Minier, of Illinois: Arbor Day is strictly observed in the State. In the large institution for worn out sailors and soldiers, we suggested to them several years ago the plan of each planting a tree on that day. Now the day is looked forward to with interest, and every year several hundred trees are planted by them. The right sentiment is being aroused among the ladies and children. "I would as lief put an elephant to mind chickens, as to try to get most men to think about such things."

V. J. Shipman, of Iowa, thinks that the western whirlwinds and blizzards have been checked by forests. The State has exemption taxation laws. In 1880 the State had, owing to wise forestry laws, twice as much forests as in 1860.

Colonel W. T. Knott, of Kentucky: The northern States are coming to us for hard woods for the manufacture of such articles as wagon tongues and staves, and the eastern States for fine woods for furniture, and with all sections thus thronging to our woods, they are rapidly going.

Maine not being represented, a paper was read from J. E. Hobbs, a member of the Forestry Committee of that State, where the forestry problem is engaging the attention of thoughtful men. Mr. Hobbs' paper stated that the hopeful state of things is largely due to the influence of the Boston meeting of the American Congress in 1885. The Maine State Grange has a membership of over 15,000 farmers. Through their influence the State established an Arbor day. An evidence of the interest manifested in the subject a call has been issued for a State forestry convention to meet at Bangor, December 18. It promises to be one of the most notable gatherings ever held in the State.

Col. E. T. Ensign, Forest Commissioner of the State, reported briefly in regard to Colorado, having prepared two papers giving a more extended account of the forest condition of that State and the Rocky Mountain Region.

No delegate being present from California, Secretary Fernow read the second biennial report of the California State Board of Forestry. It showed that, since its organization, reform was beginning to take place in forest devastation by corporations, fires, &c. The board is paying especial attention to the protection of the great mountain watersheds. The report was voluminous, and embraced the whole question of forestry in that State.

No other States being represented, this finished the reports from the States.

Mr. C. C. Binney, of Pennsylvania, was elected temporary Chairman of the Congress.

An invitation from Gov. Gordon to attend a reception at the Governor's mansion this evening was accepted.

AFTERNOON SESSION.

An invitation from the Girls' High School was read inviting the Congress to visit the school to-day at noon, to witness calisthenic exercises and tree planting by the young ladies. The invitation was accepted.

Mr. C. C. Binney, of Pennsylvania, read the following paper from the Pennsylvania Board of Forestry, sending greetings to the American Congress:

PHILADELPHIA, PA., December, 1888.

To the President and Members of the American Forestry Congress:

The Pennsylvania Forestry Association sends its most cordial greeting on this occasion of your seventh annual meeting, an event in which we cannot but take a lively interest, owing, as we do in great part, the existence of our Association to the example set by your own body.

The vastness of the evil to be contended with is but a measure of the benefits which success will bring. May it prove, therefore, only an additional stimulus to the accomplishment of the work before you. May your deliberations result in hastening the establishment of an enlightened system of forest management, national, State, local, and individual, an object which the development of public opinion, as rapid as it is striking, in favor of forest preservation, forbids us to doubt will, in time, be attained, and in the pursuit of which you will always be able to command our Association's hearty co-operation. As an earnest of this we are prepared to call the attention of President-elect Harrison to the condition of the forests upon the public lands, and to ask him officially to make known the same to Congress and urge that body to provide for the reservation of permanent national forests to be managed according to the system proposed by the bill framed by some of your own members, and presented at the last session.

In behalf of the Pennsylvania Forestry Association.

BURNET LANDRETH,
President.

Secretary Fernow suggested the adoption of "Forest Leaves," a Pennsylvania forestry publication, as the organ of this Congress. The motion was referred to the Committee on Resolutions.

PAPERS READ.

Col. E. T. Ensign, Forestry Commissioner of Colorado, read a paper entitled, "Advantages and Limitations of the Colorado Forestry System."

General A. W. Greeley read a paper on the Meteorology of the Rocky Mountain Region, which was followed by remarks from Messrs. Fernow, Minier, Knott, and Eggleston.

A paper entitled a "Plea for the Rocky Mountain Region" was read by Col. Ensign and followed by remarks from Gen. Logan.

Mr. Eggleston read by title a paper on "The Forestry Outlook."

Mr. Harrison offered a resolution in favor of securing from the United States Congress the appointment of a Commission for the examination of the condition of the public forests, the members of the Commission to be nominated by the National

Academy of Sciences. After remarks by Messrs. Poindexter, Tift, Lyman, Fernow, Ensign, and Logan, it was referred to the Committee on Resolutions.

Senator Brown, of Georgia, being present, was introduced and addressed the Congress.

Judge Brown, of Kentucky, offered a resolution for the publication of a school book on Forestry, which was referred to the Committee on Publications.

Adjourned.

THURSDAY EVENING SESSION.

At the opening of the evening session the Congress was briefly addressed by the Hon. S. J. Rauner, of St. Petersburg, of the Royal Imperial Household, who was commissioned by the Russian Government to investigate and report upon our system of agriculture. The address was received with much interest and a brief response was made by Mr. Egleston. Charles H. Smith, Esq. (Bill Arp), of Rome, Georgia, read a paper on trees, under the title, "The Temples of God," in which he spoke of many famous historical trees, and recalled pleasant and instructive passages from many authors relating to trees.

He was followed by Dr. Chas. Mohr, of Mobile, who read a carefully prepared paper on "The interest of the individual in forestry in view of the present condition of the lumber interest."

Next, Professor G. F. Atkinson, of South Carolina, read a paper on "The Desirableness of Reforesting the Piedmont Region."

General Greeley made some remarks in regard to the practical importance of the signal service as a means of predicting floods.

A committee for the nomination of officers was appointed, consisting of Messrs. Minier, Edge, Macy, Kidder, and Fernow.

Dr. A. W. Calhoun, of Atlanta, was welcomed to a seat in the Congress.

Rev. Mr. Hillyer, of Jonesboro, made some remarks upon the medicinal qualities of the Sweet-Gum.

Adjourned to 9 A. M. Friday.

After adjournment the members attended the levee of Gov. Gordon at his residence. The Governor and his family gave their guests a hearty welcome and made the occasion a very pleasant one.

FRIDAY MORNING.

The session of the Congress was opened with prayer by Rev. Mr. Minier.

The report of the Committee on Arbor Day, prepared by Hon. B. G. Northrop, its Chairman, was read.

REPORT OF THE COMMITTEE ON ARBOR DAY.

The American Forestry Congress has been the chief organization in promoting the general observance of Arbor Day. At the meeting of this Association in St. Paul in 1883, a resolution recommending the appointment of an Arbor Day especially for the *schools* in the several States and in Canada was adopted, and, at the special meeting in Washington, a permanent Committee was appointed to advance this movement. At that time Arbor Day for economic tree-planting had been adopted in four States, but no State had then enacted a law in favor of Arbor Day in schools. Cincinnati was the first city to move in this matter, and in the spring of 1883 thoroughly interested the schools in this good work.

It is now time for your Committee, having been reappointed from year to year, to give an account of their stewardship. Their first effort was to consult personally, or by letter, the Governors and State school superintendents and other influential citizens in all our States and Territories. Many such officers at first naturally deemed this an impracticable scheme, who on fuller information have heartily endorsed it and zealously worked for its success. Objections will still be met, but the logic of events has removed all reasonable doubts, and secured a general appreciation of this subject sooner than your Committee expected. It was no surprise, when a paper on "Arbor Day in Schools" was read at a national convention of school superintendents in Wash-

ington five years ago, to hear the comment, "This subject is out of place here." Though that paper was printed by the U. S. Bureau of Education and widely circulated, it *was* a grateful surprise that the next National Education Association, with an unprecedented large attendance, unanimously adopted a resolution offered by your Committee in favor of observing Arbor Day in schools in all our States and Territories. The inertia of ignorance on this subject concentrated the difficulties to be met at the outset. Once vigorously started, the movement gains fresh impetus year by year. The beginners in Arbor-Day work in each community will prove public benefactors, for they initiate a movement which will continue with wide-spread and growing results. Arbor Day has already been adopted in thirty-one States and Territories by legislative "act" or by special proclamation or recommendation of the Governor or School Superintendent. In most of the other States these officers have promised "to urge such action upon the next legislature."

We have not in any case advocated the plan of making Arbor Day a legal holiday. The "act" usually adopted *requires* the Governor annually to designate a particular date as an Arbor Day by an official proclamation, but fortunately it is simply persuasive and not mandatory as to its observance. It involves no *compulsory* interruption of business, or even of schools. If in any city, or county, the school officers and teachers take no interest in it, the schools should not be suspended for even a half day or hour. If in any district indifference or prejudice should still prevail, an enforced observance would prove a failure. Success will depend on that intelligent appreciation of this work which teachers and school officers can best create. If the time designated by the Governor should come in the vacation of any school, its observance may be anticipated, or postponed so as to occur in term time.

To the teaching of forestry in schools, the objection at once arises, "the course of study is already overcrowded," and this we admit. But trees and tree-planting form a fit subject for the practical oral lessons now common in all our best schools. Every pupil should be thus led to observe our common trees and recognize them by each of their six distinctive marks. Such lessons need occupy very little time. They would tend to form those habits of close, accurate observation of common things which are of vast importance in practical life. Nature is the great educator. Facts, objects, things surrounding us on every side in our daily life, are the prime instruments in the training of the mind, if not also of the heart. Observation precedes reflection and forms the basis for all culture. Superintendent Peaslee well says: "Those talks on trees, which were the most profitable lessons the pupils of Cincinnati ever had in a single day, occupied only the morning of Arbor Day, the afternoon being given to the practical work."

Such talks will lead our youth to observe and admire trees, and to realize that they are the grandest products of nature. Like grateful children, trees bring rich filial returns, and compensate a thousand-fold for all the pains they cost. Our schools will render new service to the State, as well as to their pupils, by leading them to observe the habits of trees, and thus making them practical arborists. Then let teachers and parents encourage every child—girl or boy—to plant, or *help* in planting, if too young to plant alone, some flower, shrub, vine, or tree, to be known by his or her name. Such offspring they will watch with pride, as every year new beauties appear, and find a peculiar pleasure in the parentage of trees, whether forest, fruit, or ornamental, a pleasure that never cloy, but grows with their growth.

The educational effect of such work and its esthetic influence are of priceless value. Tree-planting is a grand discipline in foresight. It is always planting and planning for the future. Mental myopia means weakness and folly, while the habit of forecasting is the condition of wisdom. Too often youth will sow only where they can quickly reap. A meagre crop soon in hand outweighs a golden harvest long in maturing. Washington Irving well says: "There is something nobly simple and pure in a taste for trees. There is a grandeur of thought connected with this heroic line of husbandry worthy of liberal, free-born, and aspiring men." The tree-planter can appreciate the apothegm, "To patiently work and wait, year after year, for the attainment of some far-off end, shows a touch of the sublime, and implies moral, no less than mental heroism."

Teachers can easily interest their pupils in adorning the school grounds, and persuade parents to approve and patronize this work.

With proper pre-arrangement in the selection and procuring of trees, vines, or shrubs Arbor Day may accomplish wonders. Many hands will make merry, as well as light work. Such a holiday becomes an attractive occasion of social enjoyment and improvement, and counteracts the tendency of rural life to isolation and seclusion, lifting out of the ruts of a dull plodding monotony, promoting neighborly feeling, and strengthening social ties. It tends to fraternize the people of a district when they thus meet on common ground and young and old work for a common object, where all differences of rank or sect or party are forgotten. The plantings and improvements thus

made are sure to be protected, and to remain as silent but effective teachers of the beautiful, especially to all who have shared in the work. In some large cities there may *seem* to be little room for tree-planting and no call for even a half holiday for this work, but even there, fit talks on trees or the memorizing of suitable selections would be useful, and there are few homes where children cannot find some place for shrubs, vines, or flowers, if not for trees.

One of the educating forces of Arbor Day begins when children are thus led to plant not only trees but tree-seeds, acorns, nuts, drupe-stones or pits, and then to observe the wonderful miracles which the tree-life *they have started* is working out before them. What interest and profit, what growth of mind and heart they will gain as they watch the mysterious forces of these living germs, their marvelous assimilating power carrying on such a curious chemistry in their underground laboratory, linked with the mysterious apparatus of the leaves above, transforming coarse earth and even offensive filth into living forms of surpassing beauty and fragrance. It is something for a child to drop such a germ in the earth and to justly feel and know that he has made a lasting contribution to the natural beauty around him. There is nothing more ennobling than such consciousness of doing something for future generations which may prove a growing benefaction in coming years, a better monument than any in bronze or marble. The trees which children plant around the homestead and watch from seed to shoot, from bud to limb, and from flower to fruit will be increasingly prized with a sentiment of companionship and almost of kinship as they grow into living memorials of happy, youthful days. Thus the educating influences of Arbor Day will go on, and manifest themselves more and more as the years go by, especially to all who apply Dr. Holmes' advice and "make trees monuments of history and character."

Village Improvement Societies, now so numerous over the country, should utilize Arbor Day in furthering their various plans in which the home is the objective point. The Arbor-Day work begun around the school naturally extends to the home, leading youth to share in door-yard adornments and in planting trees by the wayside. Thus by the plantings already made thousands of roads will soon become attractive by long avenues of trees. Growing on land otherwise running to waste such wayside trees yield satisfactory returns. The shade and beauty, grateful to every traveller, is doubly so to the planter, as the happy experience of thousands of American farmers testifies. In tree planting the economic and esthetic touch at so many points that the cases are rare where they really diverge.

These Village Improvement Associations foster that public spirit and town pride which invite and facilitate liberal plans and gifts. They impressively put to every citizen the question, "What do I owe to my town or city; what is it my duty, or rather my privilege, to do for it?" The sentiment that cherishes one's town and State is noble and ennobling, and has characterized the best men the world has ever seen. Men of wealth would oftener respond to such calls were the need and opportunity duly presented and appreciated. We underrate the value of this town and State pride and the need of fostering it in youth. When early formed, this sentiment will grow with years and attainments. The want of it indicates a serious defect of character. The cold and selfish soul must be sterile in all noble and heroic virtues.

When on Arbor Day, encouraged by the Governor's proclamation, every citizen is stimulated to adorn the homestead, the entire town becomes so inviting as to give new value to its land and new attractions to its homes. A penurious policy in a town is penny-wise and pound-foolish. Wise improvements *pay* in many ways, helping to retain in a town its wealthy and public-spirited citizens, and to attract desirable residents from abroad. An Arbor Day so observed will develop even in the children that love of flowers, vines, and trees—all the stronger because they have planted them—that fosters the domestic sentiments and checks the excessive passion for city life. Such adornments tend to bind the heart of childhood to the hearthstone, while slatternliness repels many youth otherwise held to the homestead. These home surroundings are the more important because they are *constant* factors in forming character. With a little forethought, and without any outlay of money, every one may with his own hand—however humble his cottage—create those adornments which shall bring content and gladness to his home and cheer to his daily life.

B. G. NORTHROP,
N. H. EGGLESTON,
J. B. PEASLEE.

The reading of the report was followed by remarks from Messrs. Weltz, Logan, and Eggleston.

Hon. Nelson Tift offered some resolutions in regard to practical legislation, which were referred to the Committee on Resolutions.

The thanks of the Congress were tendered to Gen. Greely for his attendance at the

meetings of this body and for his contributions to the interest of the occasion by the paper read and participation in its discussions.

Mr. Poindexter read a paper on Free Lumber, prepared by Adolph Leu , Esq., Secretary of the Ohio Forestry Bureau.

The time at the disposal of the Congress being limited, it was voted that henceforth speakers be restricted to two minutes, unless the house should otherwise order.

A paper on Public Parks and Forests, by M. G. Kern, Esq., was read.

Mrs. Ellen Call Long read a paper on "Some Features of Tree-growth in Florida." A vote of thanks for the paper was given Mrs. Long.

The following new members of the Congress were received: Richard Chrite, James Poindexter, and B. L. Gouling, of Ohio; Hon. R. B. Bullock, D. C. Bacon, Nelson Tift, and H. F. James, of Georgia; G. F. Atkinson, John Lawton, and T. G. McKee, of South Carolina; Hon. S. J. Rauner, of St. Petersburg, Russia; Hon. James A. Beaver, C. C. Binney, Herbert Welsh, and Thomas J. Edge, of Pennsylvania; J. D. Crary, of New York; and G. Pinchot, of Connecticut.

It was voted that at 12 o'clock a recess be taken until 2.30 P. M., for the purpose of uniting with the citizens of Atlanta in a celebration of Arbor Day by planting trees around the Girls' High School and visiting the new Capitol.

A paper sent to the Congress by Mrs. Jefferson Davis, on native trees best adapted for lawn planting in the South, with special reference to a famous live oak near Biloxi, Miss., was read.

The Committee on Resolutions made their report.

Papers were read by title, as follows:

Forest Fires in Northern Canada, by Robert Bell, of Ottawa.

Forestry and National Welfare, by Martin Conrad.

Relation of Railways to the Timber Resources of the United States, by E. E. R. Tratman, C. E., Brooklyn, N. Y.

Forestry, by Hon. Cassius M. Clay.

A communication was received from Hon. Mr. Joly inviting the Congress to hold its next annual meeting at Quebec.

The hour of 12 having arrived the Congress, according to its previous vote, took a recess for the purpose of engaging in the Arbor-Day tree-planting. The members of the Congress were invited first to the Hall of the High School, where they witnessed the calisthenic exercises for nearly half an hour. After brief remarks and songs, Prof. Slaton announced that the tree-planting would take place, after which the new Capitol would be visited. The trees were planted and dedicated as follows:

The first to Hon. J. Sterling Morton, of Nebraska, the author of Arbor Day, by Mr. Fernow.

One to Governor James A. Beaver, of Pennsylvania, by C. C. Binney, Esq., of Philadelphia.

One to Mrs. Cleveland, by Mrs. Ellen Call Long, of Florida.

One to Mrs. Harrison, by Gen. A. W. Greely.

One to Gen. Greely, by Col. E. T. Ensign, of Colorado.

One to Gov. Oglesby, of Illinois, by Hon. Geo. Minier, of Illinois.

One to Gov. Gordon, by Professor Slaton.

One to Mrs. De Jarnette, Principal of the School, by Captain Gray.

The exercises passed off very pleasantly, and at the conclusion the members of the Congress visited the new Capitol of Georgia, now nearly ready to be occupied.

AFTERNOON SESSION.

The Congress assembled at 3 o'clock.

Hon. Judge Hillyer, of Atlanta, was invited to sit with the Congress.

The report of the Committee on Resolutions was taken up for action, and after discussion and amendment the resolutions were adopted, as follows:

RESOLUTIONS.

WHEREAS, The material interests of our country are largely dependent upon the maintenance of a due proportion of forest and woodlands; and

WHEREAS, The wasteful and indiscriminate use of our forests has prevailed to such an extent as to threaten serious injury to the national welfare:

Resolved, That we earnestly petition the Senate and House of Representatives to provide without delay for the protection of the forests on the public lands of the United States from destruction by fire and from spoliation, and also for their preservation and proper maintenance by the adoption of a system based on the forestry bill introduced at the last session, and that our Committee on Legislation be instructed to call the attention of the President of the United States to these matters and to take all other possible action to effect these ends.

Resolved, That the attention of the National Academy of Sciences be respectfully called to the serious dangers which threaten the welfare of the region comprising the Rocky and Sierra Nevada mountains and plains adjacent thereto from the devastation and destruction of the mountain forests, due to the absence of proper regulations in regard to the public lands of the United States, and that the said Academy be requested to examine the basis of the above statement and to exert their high influence in recommending to Congress such further legislation for forest management as they may deem advisable.

Resolved, That, in the opinion of this Congress, it is of vital importance to the success of our work in awakening continued interest in this subject that organization should be had in each of the several States and Territories in which such organizations do not already exist; and we earnestly recommend to the legislatures of the several States to appoint forest commissions, or to direct the officials now in charge of agricultural departments, colleges, and experimental stations to add the subject of forestry to their investigations, and also to make sufficient appropriations for the work of such commissions or other officials. And we further recommend that the authorities in charge of free school education in the several States be requested to bring to the knowledge of their scholars the practical benefits to be derived from tree planting and forest culture, and to this end we recommend that the Secretary be requested to forward from time to time to the superintendents of public instruction in the several States such literature on this subject as he may have at his command.

Resolved, That the American Forestry Congress earnestly recommend all persons interested in forest preservation, whether organized into associations or otherwise, to secure legislation in their several States in behalf of the following ends:

1. Protection of forests from fire and depredation.
2. Exemption, entire or partial, of forest lands from taxation.
3. Encouragement of tree planting by establishing public nurseries for distribution of trees, prizes for plantations, and by setting apart arbor days.
4. Permanent reservation and management of forests on public lands.
5. Amendment of stock, stray and fence laws so as to preserve forest lands from injury by cattle and other animals.

Resolved, That we urge the formation of village improvement societies in the towns and villages of all the States for the purpose of planting and protecting roadside trees, and the establishing, planting, and improvement of the public squares and parks.

Resolved, That all local forestry associations be recommended to act in co-operation with the American Forestry Congress, and report their progress to our next session through delegates or otherwise.

Resolved, That all village improvement societies and other local associations organized for the purpose of promoting the objects of the American Forestry Congress be entitled to send delegates to its sessions.

Resolved, That we consider the preparation of a Forestry Reading Book for use in schools highly desirable.

Resolved, That we hereby express our high esteem and approval of the new publication, *Garden and Forest*, under the editorship of Prof. Sargent, and of *Forest Leaves*, the monthly publication of the Pennsylvania Forestry Association, and that we refer to the Committee of Publication the practicability of arranging to make *Forest Leaves* the official organ of the Forestry Congress.

Resolved, That the American Forestry Congress desires to express and put on record in some form its profound sense of the great value of the services to the cause and interests of American forestry of its Secretary, Hon. B. E. Fernow, who during the last five years has performed an immense pioneering work, in organizing and aiding the action of this Congress in developing popular interest on the subject and in obtaining the recognition by our people and Government of its great practical importance. We thank him for his faithful labors in promoting the objects of this Congress. We wish him abundant success in his official work, and we pledge him our hearty support in his future efforts for the advancement of American forestry interests.

To our retiring President, Hon. C. R. Pringle, we express our grateful thanks for his impartial and just rulings.

We express our warm thanks to the railroads which have given us reduced rates, and earnestly hope their generous course may, at no remote day, be imitated by the several State governments, in that they make provision for defraying the necessary expenses of at least two delegates from each State and Territory.

Resolved, That the thanks of the Congress are due and are hereby tendered to the reporters for their full and correct reports of our proceedings, and to the daily papers for the publication of the same.

Resolved, That our appreciative thanks are tendered to His Excellency, the Governor, to the General Assembly of this State, to His Honor, the Mayor, and the City Council for courtesies extended to us.

Resolved, That the liberality of the Young Men's Christian Association in giving us the use of their beautiful hall is highly appreciated and hereby acknowledged.

OFFICERS ELECTED.

The officers elected for the ensuing year were :

President, Governor J. A. Beaver, of Pennsylvania ; Vice-Presidents, H. G. Joly, Canada ; J. D. W. French, Massachusetts ; Chas. Mohr, Alabama ; Herbert Welsh, Pennsylvania ; George Parsons, Colorado ; Recording Secretary, N. H. Egleston, of Washington, D. C. ; Corresponding Secretary, J. B. Harrison, of New Hampshire

The following Committee on Publication was appointed :

N. H. Egleston, J. B. Harrison, and H. M. Fisher.

The Committees on Legislation and Arbor Day were continued.

An amendment to the Constitution was adopted giving the designation of the time and place of meetings of the Congress to the Executive Committee.

The following resolution was unanimously adopted :

Resolved, That the Congress respectfully call the attention of the National Congress to the great importance of more liberal appropriations to the Signal Service Bureau and the Forestry Division of the Agricultural Department for the adequate prosecution of their very important work, so beneficial to so many of our national interests, and we earnestly request them to make such appropriations.

Mr. J. D. W. French, of Massachusetts, presented a resolution asking that duty be taken off lumber. It was laid upon the table.

There being no other business before the Congress, it adjourned *sine die*.

N. H. EGLESTON,
Recording Secretary.

THE ADVANTAGES AND LIMITATIONS OF THE COLORADO FORESTRY SYSTEM.

BY EDGAR T. ENSIGN, FOREST COMMISSIONER, COLORADO.

The Colorado State Forestry Association was the first fruit of systematic and persistent local agitation of the forestry question. After that followed quite easily the enactment of a forest law, which in two years thereafter was strengthened by amendment.

The law, originally enacted in 1885, creates the office of State Forest Commissioner, and constitutes the county commissioners and road overseers throughout the State forest officers in their respective localities. The Forest Commissioner receives an annual salary, office accommodations and supplies, and travelling allowances. The county forest officers are paid per diem, according to services rendered, by the several counties.

These officers are charged with the oversight of the public forests ; to guard them from depredation as much as possible, and prevent the outbreak and spread of fire. They are also required to encourage and promote the culture of forest trees wherever practicable.

In addition to the above, there are statutes which provide penalties for the wilful or careless setting of forest fires, or for failure to extinguish camp-fires ; and the boards of county commissioners are severally required to have notices posted in conspicuous places, along the public highways, warning persons to extinguish camp-fires, and citing the penalties for failure so to do.

Inasmuch as the bulk of the forests are situated on the public lands, over which the State has no direct control, the action of the State authorities is at times limited to co-

operation with the Federal officers. This is especially true in cases of depredation, information thereof forming the basis of suits being lodged with the United States district attorney.

Arbor Day, though not yet established by law, has, through custom, become a State institution, and may be regarded as a part of the forestry system. For several successive years the day has been set apart by proclamation of the Chief Executive, and its observance has been quite general, except as limited by climatic or other natural causes.

Another matter worthy of mention here is the work being done in this behalf by the State Agricultural College. Theoretical and practical arboriculture constitute a part of the regular college course, and are taught with manifest advantage to all concerned. Provision has been made for the establishment, in connection with the college, of four experimental stations in as many different sections of the State. Two of these have already been located and action taken for the location of another. It is confidently expected that in the work of these stations much attention will be given to the science of arboriculture, in its adaptation to local conditions.

The advantages or benefits of the Colorado forestry system may be summarized thus :

1. It provides a principal or directing officer, with numerous assistants in the various sections of the State. This feature is a good one, and (in theory at least) should work smoothly and efficiently. By means of circulars and other communications issuing from the office of the State Forest Commissioner, the local forest officers are to some extent familiarized with the provisions of the forest law, and they in turn may acquaint others with them.

2. The exercise of executive power, although greatly limited as heretofore stated, has some moral significance and is not barren of practical results. Forest fires have become less frequent and destructive, and the Federal officers are aided somewhat in their efforts to protect the public timber.

3. By the dissemination of information relating to tree culture, by the distribution (necessarily limited) of plant material, and by other means, the culture of trees has been materially promoted.

4. The educational and advisory features of the system are necessarily made prominent. Much has been done, in various ways, to create a just public sentiment upon the forestry question. Special efforts have been made to show the intimate relations existing between the mountain forests, streams, and irrigation systems of the State.

The limitations of the system, though greatly less in number and degree than its advantages, are quite marked.

1. The State forest officers, having no direct control of the public woodlands, a decided limitation is thus attached to their administrative functions and usefulness.

2. Although the State Forest Commissioner is in direct and frequent communication with the local forest officers, the indifference and lack of interest often shown by the latter is somewhat discouraging. To resist and overcome this evil calls for the abundant exercise of both "faith and works."

In conclusion it may be said that the system is the result of earnest effort to improve local forest conditions. It deals with new methods, and seeks to adapt itself to conditions dissimilar to those existing elsewhere. In the absence of anything better, it accomplishes fairly well the objects for which it was created. It should be maintained until some more effective system can be devised and placed in operation.

RAIN-FALL OF THE PACIFIC SLOPE AND THE WESTERN STATES AND TERRITORIES.

BY BRIG. GEN. A. W. GREELY, CHIEF SIGNAL OFFICER.

The twelve States and Territories here considered comprise nearly one-half the area of the United States (excluding Alaska), and to the inhabitants of each and all of them the question of rain-fall is one of the greatest interest and importance. But apart from the practical value which this subject has for the four millions of people inhabiting these districts must be added the interests of the future millions who ultimately will settle in the so-called arid and subhumid regions. Private enterprise has wrought great changes in the West, but the day is fast approaching when the General Government will be obliged to define not only its general policy regarding the forests and rivers of this vast inland empire, but also pass upon the interstate question of irrigation, even if it does not give direct countenance and aid to this powerful means of increasing a thousand-fold the present value of many millions of acres of unwatered land.

In the early century this territory was viewed as hardly suited for civilized man; its enormous plains and vast mountains being represented as arid and desert regions, un-

suited for cultivation, and in many places even unfit for pasturage. Adventure, exploration, and circumstance have pushed the frontier westward until the myths of the Great American Desert to the north and of the rainless "staked plains" to the south have practically disappeared. It is none the less true, however, that the latest and most reliable American text-book of meteorology of this country speaks of the areas "between the Sierra Nevadas and the Rocky Mountains, including portions of Utah, New Mexico and California," as "a region which is almost entirely destitute of rain," and that further on the east side of the Rocky Mountains "the country is a barren desert, almost without rain."

An examination of the charts of maximum annual rain-fall and minimum annual rain-fall of these regions shows clearly that rain-fall conditions are considerably more equable than has been generally believed, so that the isohyetal lines are quite as regular on these charts of maxima and minima conditions as on those of average conditions. The minimum rain-fall has never reached zero for any year, and annual or seasonal rain-falls less than one inch have occurred in southwestern California and southwestern Arizona at few stations only. These maps of maxima and minima precipitation must be of great practical value as showing the settler or investor exactly the extreme conditions which he must expect to experience in these regions.

Another great value of the charts is the bringing to general attention and consideration very extensive areas of country in what has been known as the arid region, where late and careful observations have shown the rain-fall to be far greater than has been usually attributed, and thus transfer these areas to the subhumid districts.

The great extent to which misapprehension as to the rain-fall conditions of the arid regions has been corrected by these charts is evidenced by the fact that the area on which the mean annual rain-fall is less than 10 inches, shown on statistical maps of the tenth census at 241,000 square miles, has been reduced to 126,000 square miles, while a similar reduction is shown in the area of country where the yearly rain-fall is between 10 and 15 inches, which, given in the census chart at 385,000 square miles, is now limited to 259,000 square miles. In other words, the area over which less than 15 inches of rain falls annually has been reduced almost a quarter of a million (241,000) square miles. A large area of country charted on the statistical map as having an average rain-fall of less than 5 inches now entirely disappears in Texas, New Mexico, Utah, and Oregon, and is very materially reduced in Nevada, Arizona, and California.

Observations over a small, compact, agricultural area of South Australia afford very reliable data as to the effect of rain-fall upon annual wheat yields. It appears from these observations that 12 inches of rain in the six winter months produces 6 bushels of wheat per acre, and that for every increase of rain-fall of an inch a like increase occurs in the average production of bushels of wheat per acre. The effect of the extra rain in the season over the small area of South Australian wheat lands would give an additional fee-simple value of £10,000,000.

The importance of information as to the rain-fall conditions of the arid regions must increase steadily as time goes on, and the Eastern States become gradually filled with a more or less dense population. As has been pointed out by the Director of the Geological Survey, the arid region of the United States includes more than four-tenths of the entire country, excluding Alaska. It is believed that the accomplished Director unintentionally overstated the case when he advanced the idea that those regions should be classed as arid or incapable of successful agriculture without irrigation where the rain-fall is less than 20 inches annually. The statements put forth by him that with 20 inches agriculture will suffer drought, and will be fruitless many seasons in a long series, is equally true of regions over which as much as 25 or 30 inches fall annually. Indeed, during this very year sections of the country where the annual rain-fall ranged from 30 to 50 inches have been visited by a most serious and protracted drought, which proved most disastrous to agricultural and other kindred interests.

The point at which a region may be classed as arid and unfit for successful cultivation should be lowered, it is believed, to 15 inches. The Chief Signal Officer does not assert that this amount of annual rain-fall will be sufficient for all crops, nor on all kinds of soil, and at every elevation. Latitude, elevation, equable distribution of rain-fall, humidity, soil—all these are conditions which must be important factors in the problem. Exact observations upon these points are lacking in the United States, but in Australia observations and experiments have been made, covering now quite a number of years, on wheat (and this may be called a test crop).

The fact that wheat can be grown without irrigation in a country where the annual rain-fall is less than 20 inches is evidenced by official statistics from Dakota, which show that wheat is grown by tens of millions of bushels yearly in sections where the rain-fall ranges from 20 inches downward. Indeed, the arid region limit based on 15 inches mean annual rain-fall is a most reliable one in that region, as is evidenced by the fact that over 3,000,000 bushels of wheat are now grown annually in counties where the rain-fall ranges from 15.1 down to 13.8. (See "Resources of Dakota, 1887," an official publication.)

The report of Major Powell states that in Utah less than 3 per cent. of its lands can be cultivated by irrigation. Thirty years since it was argued that the prevalence of alkaline matter in the soils rendered it evident that the whole country was worthless for agricultural purposes, even if sufficient rain-fall prevailed, or water for irrigation was available. Experience has shown the fallacy of this statement, and it is now admitted that with water the greater part of the plateau lands are suited for cultivation. It is evident that a certain degree of elevation marks the limit of successful agriculture. But in certain portions of the arid regions, owing to the very high summer temperatures, it is probable that the summer heats raise the limit of elevation for such crops as can be developed and ripened in a few months.

Perhaps the most careful observations in connection with the effect of rain-fall upon pasturage have been made in Australia, the question being very important, owing to the immense arid regions in that country. It has been set forth, and probably with a fair degree of authority, that annual rain-fall is a most reliable index as to the pastoral capacity of a country, since grass benefits by rain at any season, although it is not to be denied that a more equable distribution throughout the year is much better than an unequal one.

Australian records show that in that climate land favored with less than 10 inches of rain a year is quite valueless without irrigation. The truth of this remark is borne out in a measure by the uplands of Castile, Spain, which, the average rain-fall being less than 10 inches a year, are of but little value. In Australia the small pastoral capacity of an arid region is shown by the fact that up to 10 inches only one sheep per square mile can be carried for each inch of rain-fall. From 9 to 13 inches, however, the increase is about twenty sheep a square mile, and for the remaining 7 to 20 inches of rain-fall the increased carrying capacity is about seventy sheep per square mile.

It has been estimated that the sandy land in San Joaquin Valley, California, would feed about one sheep to the acre in the natural state, but when irrigated and growing alfalfa it carries twenty.

The statement put forth by the Director of the Geological Survey that over 20 inches of rain-fall is necessary for the growth of forests is probably correct, and, the conditions of temperature and soil being constant, the extreme limit of the timber regions would not differ materially from the mean rain-fall line of 20 inches; but, as is well known, the timber regions have been materially reduced in area by fire. From this cause not only have these regions suffered where timber would grow freely, but the bordering line of debatable land has naturally lost all its timber; and, moreover, it is most probable that the destruction of scattered and stunted bits of outlying forests has of itself tended to still more restrict the general area of the forest regions.

The effect of forests as factors in the increase of rain-fall is more or less questioned, but the weight of opinion and of accumulative evidence tends to confirm the theory that forests do slightly increase the mean rain-fall. The confining of Indians to reservations has removed one fruitful cause of fires during the last ten years, so that the stunted forests are having an opportunity of increasing the limit only by the operation of natural laws. The immense number of planted and cultivated trees over the great plains of Kansas and Nebraska will undoubtedly contribute their part in the coming years toward the increase of rain-fall, and, what is more important, its substantial retention in the soil and more slow and equal distribution than was possible when the same amount of rain fell upon a hardened, open prairie, and, without the intervention of loosened soil and vegetation, drained at once as torrents into the beds of the nearest water-courses.

The question of irrigation is rightly deemed in the arid regions as being of the greatest importance to the general welfare, so that the subject of water-rights has claimed early attention in these Territories. In New Mexico, for instance, water for irrigation has an absolute right of way, and no work of human hands is allowed to obstruct its free flow, while all rivers and streams are declared public acequias or irrigating canals. Since, however, the land to be irrigated exceeds the capacity of the water, disputes in the future must become more frequent as to the division of these water-rights, since from time to time much land which has received a bountiful supply of water will find this quantity seriously diminished, or totally cut off, as other irrigable land is put under cultivation nearer the source of supply. It is understood that more or less complaint has already been made by the settlers in the lower valley of the Platte that the quantity of water which formerly came to them from the upper valley, which is in another State, has been materially reduced, to the serious detriment of the settlers in the lower valley. It may be put forth as a reasonable opinion that each State is entitled, for agricultural purposes, to so much rain-fall as naturally falls upon its agricultural lands, while the amount which falls in uncultivated regions might be subject to other rules as to its general and equable distribution. In any event, this may become an important question, for such people of Nebraska, for instance, as depend upon irrigation in their agriculture, when later the valleys of Wyoming and Colorado shall be put under the fullest possible cultivation.

The question, then, assumes a magnitude far greater than is usually assigned to it, affecting as it does the future agricultural interests of one-third of the area of the United States. This question, which concerns the interests of millions of people, cannot be satisfactorily discussed and arranged without a knowledge of the mean annual rain-fall which falls over the area of each particular drainage basin.

The extreme value in the arid region of every inch of rain-fall can hardly be appreciated by the population of well-watered countries. Since this is a question which affects four-tenths of the area of the United States, there seems no doubt but in the future the interests of such an enormous area will concur in urging upon Congress the question of State-control irrigation. In one of the governments of that country which most resembles the United States (Australia) this policy has lately been taken—by the government of Victoria. In Spain it is calculated that every five inches of rain-fall that can be collected off a given catchment area and brought to market is worth the same area of first-class irrigable but unirrigated land. The question which may arise between Nebraska and the Territories comprising the headwaters of the Platte has already greatly excited the public mind in Australia on the question as to whether South Australia has any right to have water flowing in the Lower Murray.

It is to be borne in mind that the rain-fall of the arid regions depends almost entirely upon accidental or cyclonic disturbances, and not (as in some parts of the world) on steady, prevailing winds which change at stated periods of the year. It thus follows that the rain at stations throughout these districts is simply the deposition of moisture in the shape of rain or snow, through the cooling of the air drawn by cyclonic disturbances from the elevation of the sea to high altitudes.

It is well known that enormous quantities of water occasionally fall in these arid regions, the phenomena being known as cloud-bursts. These downpours of rain, while injurious and even destructive at the time, yet being taken up by the earth, they serve usefully later as a water supply, through the medium of rivers, artesian wells, or springs. The quantities which fall in a single cloud-burst cannot be calculated, but the amount can be expressed by no other word than enormous. In southeastern California, in the desert country, where it has been said that no rain falls, one cloud-burst was of such extent that, although the country was nearly level, yet water fell in such enormous quantities that over a quarter of a mile of the Southern Pacific Railroad was completely swept away, and other portions of the track submerged and damaged. It is to be noted, also, that this quantity of rain fell during one of the dry months, when the rain-map showed for southern California only .01 or .02 inch of rain, barely enough to moisten the surface of the sandy desert.

That this is not a solitary case of exceedingly high precipitation in the arid region at points where no rain-fall stations are located is well known to meteorological students; as among other instances may be quoted August 26, near Hays City, Kans., and on same date near Kanab, Utah, and five days later near Coalville, Utah, the cloud-burst causing a solid bank of water between 3 and 4 feet high.

These cases might be multiplied, but enough has been given to accentuate the fact that the wide distribution and tolerably frequent occurrence of these cloud-bursts must so add to the water falling on the arid regions as to make the supply vastly greater for irrigating and other purposes, through the media of springs, streams, and wells, than these charts set forth.

The question of increasing rain-fall in the Great Interior Basin seems to be satisfactorily settled as far as the catchment basin of Great Salt Lake is concerned. The systematic and careful observations made by Prof. G. K. Gilbert, of the Geological Survey, supplemented by other data for the past forty years, which he has collated and sifted, gives with tolerable accuracy the level of the Great Salt Lake, which serves as a reservoir for probably two-thirds of the entire territory of Utah, as well as for a considerable portion of Idaho. A chart kindly furnished by Professor Gilbert shows that Salt Lake fell from 1845 to 1849; rose to 1856, fell to 1860; rose to 1873, and fell, with a slight interruption, until 1884, and rose until 1886, since which time it has a slightly falling tendency. It is significant that while the first two minima were substantially the same in 1849 and 1860, yet the minimum of 1884 is at about the same height as the maximum of 1856, and is over a foot above the maximum of 1845. As the country adjacent to the lake is substantially level, it follows that any increase in the height of the water must be most gradual, since the area of the lake and consequently the evaporating surface of water, is largely increased. This consideration would not be so important in some portions of the United States, but in a region where the annual evaporation cannot be far from 6 or 7 feet, it is a very pertinent fact.

It is a significant fact, which may, however, be overrated, that the greatest and most rapid rise of the water of Salt Lake occurred between the years 1862 and 1870; that is to say, during the period when the amount of land being brought under cultivation and the quantity of vegetation and the number of trees was most largely increasing. This increase of height in Great Salt Lake continued, too, despite the fact that irrigat-

ing canals were being brought into extensive use, so that large quantities of water which otherwise would have run into the lake were diverted to watering the irrigable lands and was absorbed by the soil or evaporated in the dry air of that region.

The rain-fall records of Salt Lake City and Camp Douglas are, unfortunately, too broken and unsatisfactory to show the exact relations of the rain-fall to the rising lake. It has, however, been stated that after 1860 a number of creeks which ran dry in summer commenced to furnish water the whole year round. The Chief Signal Officer of the Army, when serving at Salt Lake in 1867, was informed by old settlers that the name "New Creek," which was then given to the creek running through Camp Douglas, was so applied because the creek, which had never given water except during the spring freshets from the melting snow, had become a permanent stream winter and summer.

In connection with this question of secular variation and increase in rain-fall comes up also the problem as to whether forests have any effect upon rain-fall. As stated previously, the Chief Signal Officer has no doubt of the valuable services rendered to agriculture and other interests by the slow, equable, and gradual distribution of water through the medium of forests. In a recent article upon the Yellow Stone Park as a forest reservation, Prof. Arnold Hague, U. S. Geological Survey, urges the value of forests as a protecting influence for the country comprised in the lower drainage basins of rivers. He says:

"In an arid and sparsely timbered country, and one of unequally distributed rain-fall, forest and moisture maintain reciprocal relations. Experience has shown in Europe, and unfortunately already in America, the injurious effect of disafforesting a country near the headwaters of large rivers. One instance will suffice to illustrate this protecting influence of the forest. The report of the recent forestry commission of the State of New York says, speaking of the resources of the Hudson River, that the summer flow of the Adirondack rivers had decreased within the memory of men now living from 30 to 50 per cent. Many of the small streams which a quarter of a century ago were abundantly supplied with water during the entire summer are now dry during many months.

"Remove the forests from the sources of the Yellowstone and Snake, and the region will become a barren waste. The snows under the scorching rays of the sun would rapidly disappear, and early spring freshets and floods, carrying devastation before them, would strip the rocks bare of the meager soil with which they are now covered. Under the influence of the forests the soil and vegetation are protected, which in turn act as a sponge, regulating the flow and supplying the springs and streams. The climatic benefits derived from this forest-protected region can scarcely be overestimated. From the cool, wet surface of the broad storehouse of water, the dry winds coming from the west absorb immense quantities of moisture, which is again precipitated over the agricultural and grazing lands to the eastward. Not only should the present reservation be carefully guarded, but the area of the park should be enlarged to the east and south, so as to take in a dense forest region useless for agricultural purposes and destitute of mining resources."

The Chief Signal Officer concurs with Professor Hague in the opinions here advanced, and also is of the opinion that extensive forests slightly increase the rain-fall of any country, although not to such an extent as is advanced by many.

Mr. Henry F. Blanford, the able and experienced meteorological reporter to the government of India, one of the most reliable authorities on meteorological subjects, dwelt somewhat, in his last report (1885-'86), upon the effect of forests upon rain-fall. He believes that the observations in India show a slightly larger rain-fall in forests than without, and that the obvious inference to be drawn from the tabulated data is that the existence of forests increases the rain-fall. While admitting that the present evidence is not entirely conclusive, yet he expresses the opinion that the certainty of this tendency will be further confirmed by future experience. The most striking instance of apparent increase of rain-fall owing to forest production refers to the Central Provinces of India, where the rain-fall average for the past eleven years is considerably larger than when obtained from a longer period. In investigating the cause of this change the fact was developed that "extensive tracts of forests, previously devastated by jungle fires with a view to the nomadic system of cultivation practised by the hill tribes, had been brought under protection in 1875, and that thereby the area of vigorous forest growth had been enormously increased." It appears from extended observations in India that the probable error of mean rain-fall derived from ten years' observations is but 5 per cent., while the increase in this case was 10 per cent. Admitting that 5 per cent. was due to the error in the ten-year mean, it appears that an equal amount must be attributed to some local cause; and while the conservation of the forests is not positively shown to be this cause, yet this accumulating evidence is of marked importance in relation to this subject.

The secular variation of rain-fall, as has been set forth by many writers, may be con-

sidered as undoubted : but as to whether it follows any known or definite law is very much to be questioned : since, although a succession of dry years follow each other, which are succeeded by others about the mean, and then again by a succession of wet years, yet it does not need a very elaborate comparison to show that excesses of rain prevail in a given year in one section of the country while deficiencies occur in the same year in others.

The Chief Signal Officer does not hesitate to express the opinion that the trans-Mississippi and trans-Missouri rain-fall is slightly increasing as a whole, though in certain localities it may be slightly decreasing from causes set forth above, and it seems most proper for him to put forth his strong conviction, even if it be not a certainty, when, as in this case, it will tend to reassure the agricultural population in the lately drought-stricken districts of the West. There appears no possible reason to believe that the scanty rain-fall of the past year or two will not be followed by increasing precipitation in the next few years, which will maintain the annual rain-fall of these sections at the average, or even increase it.

A PLEA FOR ROCKY MOUNTAIN FORESTS.

BY EDGAR T. ENSIGN, COLORADO.

It is estimated that in the State of Colorado, and in the Territories of Wyoming, Montana, Idaho, Utah, Arizona, and New Mexico, about 95,000 square miles, or say thirteen per cent. of the entire area, is timber land. By this is meant all kinds of timber or forest growth, light and heavy, valuable and inferior.

The forests of this region, which are mainly coniferous, are mostly situated on the mountain slopes, at altitudes varying from 4,500 to 12,000 feet above the sea ; in a few instances the timber line extends to a height of 12,400 feet. Some of the foot-hills and mesas have a scattering, inferior forest growth, and many of the streams which flow from the mountains are bordered with cottonwood and a few other native deciduous kinds. Large tracts in the mountains, from which the evergreen forest was burned, have since been covered with groves of aspen, commonly called "quaking asp." Other extensive areas are wholly denuded of forest growth, and, with their rocky, seamed, and storm-beaten surfaces, are desolate and forbidding in the extreme. Crowning all are naked mountain crests and snow-clad summits.

Except in a few favored localities, the forests are not dense. Quite compact and heavy growths of spruce are sometimes found at the higher altitudes and upon the mountain slopes. The yellow pine, the most generally useful timber tree, seeks a lower level than the spruce, and is usually confined to the southern slopes in warm and dry situations. When the pine forest has been destroyed it is difficult and often impossible for it to reproduce itself, owing to the prevailing arid condition. On northern slopes, the home of the spruce, where snow and moisture are longer retained, a second growth is more likely to appear.

The lumber product of the pine and spruce, though inferior in quality, is used for a variety of purposes. Dwarf cedar, common to the foot-hills, is used extensively for fence posts ; pine, piñon, and other kinds are used for fuel.

The altitudes of the Rocky Mountain region, inclusive of the valleys, plains, and plateaus, vary from 680 feet above sea level, at Lewiston, Idaho, to an extreme height of 14,400 feet in the mountains of Colorado. The average, or mean, elevation of several of the political divisions is given by good authorities as follows : Montana, 3,000 feet ; Idaho, 4,700 feet ; New Mexico, 5,600 feet ; Wyoming, 6,000 feet ; Colorado, 7,000 feet.

The approximate mean elevation of the Idaho and Montana ranges is 8,000 feet ; of the Wyoming ranges, 9,000 feet. The mean height of the Colorado and New Mexico system, south to the latitude of Santa Fé, is about 10,500 feet. Prominent mountains appear in all parts of the region. The best known and named peaks of the Colorado system, sixty-seven in number, vary in height from 10,906 to 14,464 feet. Seventy-two other peaks in the same State, between 13,500 and 14,300 feet in height, are unnamed.

I have thus indicated the great altitude of the region. It extends from the British possessions to the Mexican boundary. At least seven-eighths of its entire area lies north of the parallel of Atlanta. As a result of its high altitude and comparatively northern situation, its snowy mountains and forests, powerful rivers are thus produced. In viewing its drainage system it should be noted, however, that no important distributing centre is found south of Colorado. The principal rivers of the region, as indeed of the entire West, are the Missouri, Columbia, Platte, Colorado of the West, Rio Grande, and Arkansas. The first two rise in the mountain ranges of Montana, Idaho, and Wyoming, in what might be called the north-eastern and north-western basins, their waters flowing respectively to the Atlantic and Pacific. The other four emerge

from the Colorado system, and carry their blessings (and sometimes ills) to widely divergent sections. Hundreds of lesser and tributary streams have a similar origin.

During the few years covering the rise and partial development of the mountain territories, soon, it is hoped, to become strong and popular States, gold and silver mining and live stock growing have been their chief industries. In the near future agriculture is likely to take precedence of the others; its recent progress, fostered by great systems of irrigation, has been almost phenomenal. Great agricultural enterprises, similar in kind, if not in degree, to those of Colorado, have already been inaugurated in all of the Rocky Mountain territories. It is obvious that the demand for water, at present very great, will be largely augmented in the future.

In this connection I may allude to the recent action of Congress in authorizing the making of topographical surveys to determine what lands of the mountain and plains region may be reclaimed with the aid of irrigation, the water supply available for such a purpose, and where reservoirs, canals, and other irrigation works should be constructed. In view of the agricultural possibilities contingent upon this action, and the probable prevention of floods in the great rivers, this movement for the storage and utilization of water is of first importance to large portions of our common country.

But what, it may be asked, is the immediate connection between the forests of the Rocky Mountain region and its irrigation systems? The forests are the principal natural agencies in regulating the flow of water; they prevent the premature melting of snows and protect and nourish the sources of streams. In other words, aside from the office performed by them in attracting moisture and causing precipitation, it is evident that the forests in question, by reason of their location and character, and the surrounding physical and economic conditions, are of vastly more importance for the conservation of water than for any other purpose. In fact, may it not be presumed that this was the great object for which they were created?

The principal destructive agencies, as affecting the forests of this region, are—

1. *Fire*.—In nearly all operations for the utilization of forest products a mass of combustible material is left behind, and then the careless use of fire in a dry period kindles a disastrous conflagration. All ordinary demands upon the forest, even with the wasteful methods in vogue, might be met if destruction by fire could be avoided.

2. *Railway Construction*.—Railway building in the Rocky Mountain region, especially in Colorado, is increasing in such rapid proportion as to offer a most serious menace to the existence of the forests. After the tie-chopping legion come settlers, miners, lumbermen, charcoal burners, and others, all of whom, in addition to the havoc wrought by themselves, prepare the way for that most dreaded of all enemies—fire. The demand of the railways for cross-ties, timber, and dimension lumber causes the most serious drain upon the forest. For ties, only the young, partly grown and most vigorous trees are used; the consumption for that purpose alone is enormous. The timber so obtained, as compared with other available material, is inferior in quality. Cedar and oak ties, from the southern, lake, and Pacific forests, can be delivered in Colorado at a cost not exceeding one-third more than the native pine ties; the former are in every way superior, and their period of usefulness is at least double that of the latter. Therefore no hardship would be imposed in requiring railways to draw upon other than the mountain region for their timber supplies.

3. *Lumbering*.—The erection and operating of saw-mills to supply local and ordinary demands for lumber would not be specially objectionable if the business could be conducted under proper regulations and restrictions. Under existing laws, however, most flagrant abuses are perpetrated, and the forests suffer great and unnecessary loss.

4. *Mining Operations*.—The requirements of the mining industries (including coal mining) are great and rapidly increasing. The timbering of mines, construction of shaft-houses, smelters, dwellings, and other necessary buildings, call for a liberal use of timber. In some of the older mining districts the timber supply has been exhausted, and such material is brought from a distance at undue cost to the consumer.

5. *Charcoal Manufacture*.—This, in certain localities, is a very destructive agency. The charcoal burner is as merciless as the hand of fate! He spares not the smallest and most insignificant forest growth, if nothing better is within his reach. The industry is fostered by the requirements of smelters, which consume great quantities of charcoal in the reduction of ores. The use of charcoal for this purpose is not imperative; under certain processes charcoal is a cheaper fuel than mineral coal or coke. At some of the principal works but little, if any, charcoal is used.

I have thus endeavored to explain some of the conditions under which the Rocky Mountain forests exist, the special need for their continuance, and the principal dangers to which they are exposed. Permit me to ask that in addition to the general interest you may take in forest preservation and forest culture, you will actively co-operate in all proper efforts that may be made to shield from further injury the forests of the Rocky Mountains.

THE FORESTRY OUTLOOK.

BY N. H. EGGLESTON, WASHINGTON, D. C.

Disappointed though we may be in not having been able to accomplish the particular object for which we have made special efforts during this year and to secure the legislative action in behalf of our public forests which we deem so important, there is yet much to encourage us in the general outlook which we may take at the present time. There is a general rising of the tide of public opinion in regard to forestry matters. If there has been no marked advance at any one point, there has been some progress all along the line. Nowhere has there been a lessening of interest in the subject which specially engages our attention and efforts; almost everywhere there has been an increase. The newspaper press reflects public opinion. It a trustworthy indicator of what is at the time engaging general thought, and every observant reader must have noticed the increasing frequency with which subjects relative to forestry have found a place in many of our papers. We are in danger of becoming impatient because the visible progress is not as rapid as we wish or as seems to us desirable. We need to remember that public opinion, like the trees themselves, is of slow growth. Like the annual rings of the trees also, which sometimes are so indistinctly marked as to be obvious only to a careful scrutiny by a trained eye, the advance in public opinion from year to year, or during any brief period, may not always be easily discernible. Consider what an educational process is involved in this matter of Forestry and what a comparatively slow process that of education always is. It is only a few years since the word forestry became a part of our common speech. It was hardly in the dictionary. It belonged to the vocabulary of the scholar or the specialist. Even now it has a definite meaning for only the comparatively few, and most persons have done little more as yet than to learn the alphabet of forestry. We are at present in the primary school of this subject, and education in the primary school is effected only by the frequent iteration of the same simple things. Advancement at this period therefore seems slow, and is not very obvious. Nevertheless there is progress.

And so, with considerations like these in mind, I think if you will look over the field with me as well as we are able to do in the brief time that can be allotted to it here, we shall find encouragement to go on with the work in which we are engaged. I think we shall find encouraging progress has been made during the present year.

Turning our eyes, then, to the farthest East, we find that the people of Maine, known as the Pine Tree State, because it was so early and so long the chief source of supply to the markets of the country of white pine lumber, have for some years been sensible of the detrimental effect of sweeping off their forests as they had formerly done and have restricted their cut to nearly the measure of annual increase by growth. Two years ago the Legislature established Arbor Day, and the various Granges of the State are doing much to secure its observance and to make it both pleasant and profitable. A call has also been made for a Forestry Convention to be held in that State a few days hence. The feeling in regard to forestry matters may also be judged from the fact that the Governor has commissioned one of its citizens to attend this body as a delegate, whose voice it will doubtless be our privilege to hear.

Massachusetts, one of the earliest States to guard the forests, within a few years has adopted legislation calculated still further to promote the interests of forestry. This legislation embraces laws to protect the forests from fire and from careless or wanton injury, to exempt plantations of forest trees from taxation for a certain number of years, and to enable cities and towns to take and manage lands for the purpose of preserving and cultivating forest trees thereon. The State is encouraging the planting of trees on mountain, rocky, and marshy lands which are unprofitable for ordinary cultivation, if not incapable of it. The State Board of Agriculture is made also a Board of Forestry. The Massachusetts Society for Promoting Agriculture ten years ago offered liberal prizes for tree-planting, and this year has awarded a thousand dollars for one plantation. Arbor Day has also been established within the last two years. The State Census of 1885 showed that the woodland in this State was then more than 30 per cent. in excess of what it was twenty years before.

Connecticut, within the last two years, has enacted a law exempting planted forests from taxation for a period of twenty years, and has established Arbor Day and connected its observance with the public schools. The Granges in the State have been prominent and efficient in the observance of this day.

New York is the only Eastern State which has any public lands or any forests which are under government control. Of the nearly 4,000,000 acres constituting the Adirondack Wilderness, the State owns nearly 1,000,000. It owns also more than 50,000 acres in the Catskill region, south of the Adirondacks. This State, therefore, has before it, in the main, the same problem of forestry which is before the Federal Government as to the management of its 80,000,000 acres of forest lands. After much discussion of the subject and long delay in taking action, while fires and thieves were making havoc

of this most valuable forest tract, the State in 1885 appointed a Forest Commission, consisting of three commissioners. Already very gratifying results have come from the appointment of this Commission. The Report for 1887 states that the ravages of fire in the forest region have been almost entirely stopped, while timber thieving and other depredations have been suppressed, and \$14,000 have been recovered by actions against former trespassers. The protection of this forest is an instructive illustration of the wide extent of the beneficial influences of proper forest management. The prevention of fires in the forests belonging to the State has removed a cause of frequent fires in the forests adjoining them, the property of individuals. The value of such property has in consequence been much enhanced.

It deserves mention also that the Legislature of this State in 1887 established Arbor Day.

Pennsylvania is manifesting a steady growth of interest in forestry. Two years ago a State Forestry Association was formed and branch County Associations have also been established. The Society has shown a vigorous life from the beginning. It has held frequent meetings for discussion, has given to the public lectures on the subject of forestry in its various aspects, and has published, from time to time, a sprightly paper entitled "Forest Leaves," the only strictly forestry publication of which our country can boast. Through this publication and in other ways the Pennsylvania Forestry Association gave your Committee important aid in the endeavor to secure the passage of a national forestry bill at the last session of the Federal Congress.

The last Legislature of Pennsylvania passed an act for the encouragement of forest culture, by one provision of which a premium is paid to persons who plant forest trees. The Legislature also appointed a Commission to inquire into the subject of forestry and propose a proper act for the encouragement of timber-culture and the preservation of the forests.

As we pass from the Northern to the Southern States, which are generally much more heavily wooded than the former, we find that less attention has been given to forestry. This is only natural and what might have been expected. The dense southern forests have not yet been depleted as have those of the North. A sparser population, a milder climate, and fewer manufacturing establishments have caused the demand for fuel, which is everywhere the chief demand upon the forests, to be less than in the former region. But it is not too soon to give attention to the interests of forestry here. The condition of things has been rapidly changing within a few years. The South has been opening mines and building furnaces, factories, and railroads with great rapidity of late. An increasing demand for her lumber has also arisen abroad as well as in the Eastern and Western States, occasioned partly by the fast diminishing supply of the northern white pine, which has so long been the staple lumber of commerce. These causes, taken together with the wasteful methods of the turpentine industry as too often practised, call for effective measures on the part of the Gulf States for the protection and careful utilization of their forest wealth.

The conventions which have been held in this region during the last three years for the discussion of the subject, the formation of the Southern Forestry Congress, and the meeting of the two Forestry Congresses here at this time and their happy union effected, encourage the hope that these States, so richly endowed by nature, will pursue such an intelligent and conservative system in the management of their timber lands as will be in harmony with all their other interests and prevent them from suffering, as so many States and Nations have done, from the reckless consumption of their forests.

It is to be counted one of the encouraging signs that a beginning at least has been made in giving instruction in forestry at the University of North Carolina. Georgia has made a movement for the appointment of a Forest Commissioner for the State, and for other action calculated to promote her forest interests. She has also adopted Arbor Day. A hopeful movement has also been made in Florida. Two Forestry Congresses have been held in that State, and Arbor Day has been observed with much zeal. The formation of a State Forestry Association in Texas during the last year also deserves to be chronicled. Kentucky and Tennessee, well wooded, and distinguished for the predominance of the most valuable hard woods in their forests, are showing an encouraging interest in forestry. Both have recently adopted Arbor Day and have established it in connection with their public schools.

Passing to the Western and Northwestern States, there is in almost all an increasing interest in forestry. There is a great contrast of situation between the northern prairie States and those in the lower valley of the Mississippi and on the Gulf. In the latter the demand is for the conservation and economic use of what is now an abundant and in some cases an overabundant supply of tree growth. In the former it is for the absolute creation of forests by planting trees where until recently there were none except along the borders of streams. In Kansas and Nebraska to plant trees is one of the first necessities of life. A house is hardly more needful. In Arkansas our reports

say that the only interest in forestry is "to get rid of the timber." Nebraska has only 3 per cent. of woodland. Arkansas has 81 per cent. It is not so surprising as otherwise it might be, that Nebraska originated Arbor Day or tree-planting day, and that she has now nearly 1,000,000 acres of planted forest. The visible appearance of that great State is quite changed from what it was a few years ago. There is an enthusiasm for trees there, as there is in some of the neighboring States, which promises well for the future agricultural and other interests of that region. Where a people have planted trees they will care for them and not allow their forests to be ravaged by fires or be made pasture ground for cattle.

Tree planting is practised in Kansas with as much energy as in Nebraska. The Horticultural Society of the former State is distinguished for the attention which it gives to the subject of forestry. Its annual reports abound in valuable information upon the subject. Early in the last year the legislature passed an act establishing the office of Commissioner of Forestry and providing for two experiment stations for the purpose of growing and distributing, to those applying for them, trees suitable to the soil and climate of Kansas.

Iowa ranks with Kansas and Nebraska in the interest taken in forestry matters. Iowa was one of the first, if not the first, of our States to engage in the teaching of practical and scientific forestry, instruction on this subject having been given for several years in her Agricultural College. Arbor Day was early adopted in Iowa. The Horticultural Society offers premiums every year for tree-planting, and publishes pamphlets of valuable instruction on the subject, and the law makes it obligatory upon the directors of each school district to set out and protect twelve or more shade trees on each school-house site where there are not that number of trees already growing.

Similar is the condition of things in Minnesota. A Forestry Association has been in existence there for several years, and publishes a forest-tree manual, which has been of much service not only in Minnesota but in other States.

Michigan, as her great pine forests have become well-nigh exhausted by fires and the lumberman's axe, is becoming more economical in the use of what remain and is encouraging seeding and planting. The State Board of Agriculture has recently been constituted by the Legislature a Board of Forestry for the purpose of devising and proposing the needed legislation in behalf of forestry. An important and zealous forest convention has been held during the present year, and the State is now being canvassed by the Commission for the purpose of obtaining the information needed for the proper discharge of the trust committed to it. A class of twenty-five students has been receiving instruction at the Agricultural College.

What the value of the forests of many of our States is or may be, from a material point of view alone, and how deserving of proper protection and husbanding, may be seen from the fact that the estimated value of the white-pine product of Michigan during the last twenty-five years has not been less than \$870,000,000, and that the annual product, which, in 1864, was estimated to be worth \$8,000,000, was, in 1884, worth \$67,000,000.

We pass by the Rocky Mountain region, the forests of which belong largely to the General Government, and are, as we know, without any care or protection deserving the name. Wide-sweeping fires consume year by year millions of acres. The United States refuse to expend the pittance that would guard these forests and encourage their increase, and they are left to the plunderers and the flames. Colorado must be mentioned, however, as possessing the distinction of being the first and only State to make a constitutional provision for the protection of forest property. Her devoted and efficient Forest Commissioner has done much to develop among the people of that State a proper feeling in regard to the forests, and has recently published a forest map of the State.

Such is the result of a hasty outlook over our wide-spread country and a survey of the present condition of our forests. May we not take encouragement from the sight for the continued prosecution of our work? If we can point to no great and conspicuous advance, obvious to all, we do see signs of progress in almost every direction. The seed sown is beginning at least to germinate. The establishment of Forestry Associations and Forest Commissioners in so many States shows an increasing and permanent interest in the subject of forestry. The institution of Arbor Day in ten States during the last two years, in addition to those which had previously adopted it, thus bringing almost all our States and Territories into line in the observance of this day, is a good omen. Every such thing tells in the right direction. It is something to have the children in our schools instructed about trees. It will give them many happy and useful thoughts and many happy hours. It will open to them many wide doors of knowledge. They will grow up with the trees as their friends. This generation may be the destroyers of the trees; the next will surely be their protectors.

THE INTEREST OF THE INDIVIDUAL IN FORESTRY IN VIEW OF THE PRESENT CONDITION OF THE LUMBER INTEREST.

BY CHARLES MOHR, PH. D., MOBILE, ALA.

In view of the present activity of the industries depending immediately on the products of the forest, the question naturally arises, what are the steps necessary to best secure the interests of the individual owners of forest lands? In its discussion on this occasion the 180 million acres of forest woodlands are referred to belonging to the farms within the Atlantic forest region, covering fully one-third of its whole forest area. It is to the farmers, the owners of this vast forest area, that one might hopefully look for its protection and preservation, as a class more than any other affected by the evils resulting from the destruction of the forest cover of a country if carried beyond a certain limit. Throughout the States embraced within this region possessing yet the greatest timber wealth in their virgin forests, in the Lake States of the north, and in the Southern States from eastern Texas and Arkansas to the Atlantic coast, the lumbering interests have of late years vastly increased and with them the strain upon the resources of the forests. Since the beginning of this decade great strides have been made not only in the increase of the annual output of timber, lumber, and all other forest products, but also in the improvements introduced at the mills tending to the greatest production at the least expense and in the utilization of a large percentage of material before thrown away as useless waste. To meet the demands of these constantly increasing interests, at least on this side of the Mississippi river, the timber lands in the southern lumbering districts fronting the water-courses and railroad lines have to a great extent become exhausted within the distance to render the hauling of the timber by teams to these lines of transportation any longer profitable. In order to overcome this difficulty canals and ditches have been dug wherever practicable, and many miles of tramways were constructed, equipped with iron rails and steam power, penetrating the forests to the very divides which separate the basin of one river from another. Enterprises of the latter kind require the outlay of vast sums of money and are costly to maintain. Temporary as they are, to render them profitable they must be kept working to their fullest capacity and without loss of time. Consequently, wherever they have been introduced the depletion of the timber lands within reach is effected at a rate never existing before. The resulting production under the high pressure of capital is unavoidably leading to its concentration and is carried on with the sole object of speediest returns, without heed of the future. The exhaustion of the white-pine forests in the North, almost accomplished within the past quarter of a century, offers a startling instance on this point. From the depleted districts of that lumbering region large amounts of capital have been transferred to the new fields open for investment in the pine forests of the South. With the progress in the building of new railroad lines throughout the Southern States the timber wealth of districts heretofore inaccessible is constantly opened to markets. In fact, the forces which have led to the depletion of the timber wealth of the North are at present at work with increasing energy in the South, and the conclusion cannot be avoided that, under the strain to which they are and will be exposed, the depletion of the Southern forests will scarcely take a much greater length of time. The results of this great progress in the development of the resources of the forests in this section, however, have been far from proving satisfactory to the private owners of forest lands, either in the timber trade or in the working of the pine forests for their resinous products. Eager to realize from what such owners are wont to regard as the most unprofitable part of their property, they are too apt to throw at the first chance the products of their forest woodlands upon the market in ignorance of its requirements. In consequence, overstocking and competition caused their disposal at prices, if not resulting in actual loss, in most cases far below their actual value. The frequently occurring depression in the prices of forest products fall most heavily upon the owner of the land from which they were taken, as he finds himself deprived of a profit not likely to accrue to him again from the same source. Irreparable are the losses sustained in that way, chiefly caused by overproduction, by the owners of pine timber lands appropriated to the manufacture of naval stores. Year after year the destruction of tens of thousands of acres involved in this industry has been accomplished without any adequate return for such damage.

With such facts before them the first step to be taken by the private owners of timber lands in order to secure their interests would naturally be to hold on to them by all means, and to keep them intact from invasion until sure of the proper remuneration. The time is near when property of this kind properly protected and cared for will give his estate the most lasting and ever-increasing value. In support of this assertion only the fact need to be pointed to, that at present the annual products of the forests of the United States represent a value of not less than eight hundred million dollars, exceeding that of any other product taken from the soil, vegetable or mineral. Further, the timber lands of the public domain, those owned by the several States and by the rail-

road corporations, are rapidly taken up by capitalists and will within a short time be out of the market. The opportunities to acquire such lands or their usufruct at mere nominal prices as they existed at the beginning of this decade have gone by forever. With an advanced public opinion forest property is less open to trespasses than before, and with the increasing facilities of common caution to make their products available, the prices of timber lands are steadily advancing and nearing the level of their intrinsic value. With the general recognition of these facts the owners will find it to their interest to manage the resources of their woodlands on principles of sound economy and bestow upon them the same attention given to their lands under cultivation. In no other way can the farmer serve his own and the interests of those depending upon him better than to take time by the forelock in taking without delay the proper steps to that end. The pioneer stage in the life of the farming population on this side of the Mississippi river has passed. The risks to leave a homestead for new fields in order to improve his condition have increased to a degree to wed its intelligent owner to the clod, and to seek his prosperity in the utmost development of the advantages nearest to him in the improvement of his place. In the systematic management and improvement of his woodlands and their extension over his lands that are waste or unprofitable under tillage, the farmer will find the strongest auxiliaries to add to its permanent value. By their aid he will maintain conditions essential to keep up the productiveness of his soil, conditions most conducive to health, in many ways adding to his necessities and comforts and conditions, that if not immediately will without fail eventually add to his income.

The first steps to that end are simple and clearly indicated in the adoption of measures of protection and in assisting the efforts of nature to restore where deterioration and destruction have taken place. Before any other the forest must be kept free from the chief agents of its destruction—the invasion of fire and live stock. To their suppression untiring efforts must be made by word and by action, not only in securing the power of the State in the passing of the necessary laws, but to create that state of public sentiment which compels their rigid enforcement. Next let the axe be used judiciously. The indiscriminate clearing of lands for cultivation rendered unprofitable after a few crops, and abandoned, to be left to utter deterioration by wind and rain, is to be avoided as one of the greatest mistakes in the management of a farm; also the useless waste of timber as commonly practised. In the cutting of timber with the prospect of proper returns and at the same time to make room for the younger growth every precaution should be taken to avoid injury to the latter, and the débris removed to lessen the danger and force of fire. Under a temperate clime and blessed with a bounteous rain-fall throughout every season of the year, this Atlantic forest region, with the limits as defined, from its northern limits to the Gulf shore, presents conditions favorable to tree growth equalled by but a few other portions of the globe, and unsurpassed in possibilities for its promotion by man. However, to turn them with the best results to his especial uses requires close observation and study of the workings of nature in the light of the understanding of her laws. Though great progress has been made of late years to promote the interests of agriculture in the way of public instruction, and lavish as the means are to be devoted to the teaching of its theory and practice, but a few isolated efforts have as yet been made to afford to the private owners of forest lands the light of scientific knowledge to aid them in the management of the 180 million acres of their forest woodlands, and in the restoration of the forest growth on the 30 million acres of waste lands connected with their farms, to render them a source of income and to restore those impoverished to their original fertility. Hence another and not less important step to secure the interests of the private owners of forest lands is to insist on the adoption of a course of instruction imparting the proper knowledge in those branches of science upon which the principles of forestry are resting, by the universities and the agricultural colleges supported by the State.

To the question, will the attention to the principles of forestry pay with us, can be given almost as satisfactory a reply as to the question, will intensified farming on correct principles pay. To cite in support of this, in detail, the financial results achieved in those countries of Europe where the management of the forest forms a branch of the public service, or the achievements of a wise, energetic, and honest administration of the forests in India and the Cape of Good Hope, countries twenty-five years ago with their forests as open to destruction by ignorance and rapacity as the forests of this country are to-day, would exceed the limits of this discourse.

That even under the existing disadvantages such management of the woodlands bears results satisfactory to their private owners is clearly demonstrated by many instances wherever the scarcity of forest product is beginning to make itself felt. The advance in the value of untillable lands deprived of their original timber growth in New Jersey; the promising state of the forests of white pine of second growth in Maine; the successful reclamation of worthless tracts of land on the coast of New England by restoring upon them the forest growth; the promising young forests, the results of plantings

undertaken during the last quarter of a century in many of the States of the Northwest, can serve as encouraging examples, well calculated to incite to similar efforts in other parts of this forest region.

Immense as its resources must yet appear, and possessed of every facility to make them available for the great markets of our own country and those of foreign lands, the South is destined to be the chief centre of the lumbering interests on this side of the Rocky Mountains. The supplies stored up in the forests of this southern section of the Atlantic region must henceforth supplant those heretofore furnished by others deemed but a short while ago equally rich in their resources, but now exhausted. From these southern forests it is that, besides the supplies for the markets east of the Mississippi river and those demanded for foreign export, the needs must be furnished of the practically treeless territory bordering upon their western limits—a territory of vast extent, destined to support millions and rapidly filling up with an energetic and thrifty population.

In view of such facts, which cannot be disputed, the work should not be longer delayed to secure for the future the advantages flowing from the inheritance of such vast forest wealth enjoyed at present—a work in the performance of which the farmer should take a most active part as one most directly interested.

NOTES OF SOME OF THE FOREST FEATURES OF FLORIDA, WITH ITEMS OF TREE GROWTH IN THAT STATE.

BY MRS. ELLEN CALL LONG, TALLAHASSEE, FLORIDA.

So much of the State of Florida as lies north and west of a line extending from the head of Charlott's Harbor northwest to the Atlantic coast, about the 29th parallel of north latitude, is embraced in and forms the southeastern limit of what is known as the "Southern Maritime Pine Belt" in the subdivision of the Atlantic region of North American forest area.

This Maritime Pine Belt of the Southern States, extending southward from the 36th parallel of north latitude along the Atlantic from 100 to 150 miles in width to the points above indicated in Florida, and thence westwardly along the Mexican Gulf coast to the valley of the Mississippi, embraces within its limits no finer body of merchantable timber than is to be found in the State of Florida. The species giving identity to this division of American forest is *Pinus palustris*, or Southern long-leaved pine, than which no other one kind of American tree has a more exalted value, not alone for lumbering purposes, but in the vast supply of tar, pitch, turpentine, and resin derived therefrom.

The recent application of the green foliage of this tree to the manufacture of material for the covering of cotton bales will add only another feature of enormous value to the forest resources of this Southern pine belt.

The U. S. census returns for 1880 report 1,853,582,000 feet of sawed lumber (board measure) manufactured during that year from the Southern belt.

Of this output, which would lay a close floor one inch thick over an area of more than 66 square miles, Florida is said to have furnished about 200,000,000 feet, or something over the *one-ninth* part.

Next, perhaps, in commercial importance and value among Florida's forest products is the extensive growth of cypress trees.

Within late years this timber has come more generally into use than formerly. While softer than the timber of the long-leaved pine, it is much lighter and tougher. It has latterly come greatly into vogue in European countries for ship-building. It has greatly superseded in the South the use of northern white pine for the manufacture of doors, sash, blinds, and *pails*. It supplies the great demand for fish and syrup barrel material, and is *par excellence* the shingle timber of the Southern States.

One other item of great value to Florida in her forest growth is red cedar (*Juniperus virginiana*), from which millions of pencils are annually manufactured.

The wood of this tree grown in Florida is peculiarly fitted for pencil making by reason of its softness, smoothness of texture, and freedom from knots and wind-shakes. The celebrated Faber and Eagle Pencil Companies have for years operated saw-mills at Cedar Keys, on the Mexican Gulf, where the cedar logs are sawn into merchantable blocks and sticks, and sent north to the pencil mills.

The absence in Florida of a bureau of statistics for the collection and compilation of data relating to internal resources puts it quite out of the power of the writer to offer any definite figures as to the amount of merchantable timber standing in the State.

Any estimates, quantitative or qualitative, that may have heretofore been made upon this subject are purely hypothetical, and worthy of very slight consideration.

Much incorrect information has been furnished the public on the subject of Florida's forest areas and the supply of different timbers, a striking example of which occurs in

a beautifully colored map of the State in the census report of 1880, wherein the four great counties of Jefferson, Leon, Gadsden, and Jackson are excluded from the timber-growing district.

It is, however, of some of the peculiarities of Florida's climate and soil, as related to *forest reproduction*, that the writer feels authorized to speak rather than of the economic and commercial values of her present forest supply.

There is, perhaps, no section of the United States so well suited to the rapid growth of forest trees as the whole State of Florida, and such parts of Alabama, Mississippi, and Louisiana as lie adjacent to the sea-board. The long growing seasons, the regularity of annual rain-fall, the average humidity of the atmosphere, high summer temperatures, absence of rocky sterility in the soils, and the very general distribution throughout the section indicated of the tertiary limestone formation, accompanied by widely diffused marine shell deposits and outcropping of phosphatic matter, give to this region conditions peculiarly fitted to vigorous tree growth.

The three agencies which militate appreciably against tree growth in this section are, in the order of their destructiveness, forest fires, cyclones, and lightning. The latter of these destroying causes, while far less conspicuous to the casual observer than either of the other two, is nevertheless a very potent factor in big-tree destruction along the gulf sea-board during the late summer months, when severe electric storms are of daily occurrence.

The writer, in the month of September, 1886, counted eighty-six large pines, that had been recently struck by lightning, that could be seen from the carriage road along forty miles of travel through the pine woods southwest of Tallahassee.

The aggregation of such destruction, if equally distributed throughout the coast country, amounts annually to a great many hundreds of thousands of feet of first-class lumber destroyed by this means; for it is generally the tallest and largest trees that the fiery bolts light upon.

About the time of the autumnal equinox severe gales are apt to prevail in western Florida and along the coast to Texas. While these storms frequently assume cyclonic characteristics, they never acquire the velocity and severity that attaches to them in the Northwest, owing, we presume, to the fact that the Gulf coast region is so much nearer the breeding place or centre of the disturbance.

While these equinoctial gales do destroy considerable quantities of timber in the southwestern regions of the Southern Maritime Pine Belt, they accomplish far less destruction than would be the case were this belt located further away from the storm centres.

"Forest fires" is a term of very different signification throughout the Southern pine belt from the meaning attached to it in the North and West. There they are destroyers of forests, pure and simple, without any economic advantages attending their occurrence.

But there is sound reason for believing that the annual burning of the wooded regions of the South is the prime cause and preserver of the grand forests of *P. palustris* to be found there; that, but for the effect of these burnings, the pine forests would never have been, and but for the continued annual wood firing that prevails so generally throughout the South the Maritime Pine Belt would soon disappear and give place to a jungle of hardwood and deciduous trees.

In the persistent application of the law of the survival of the fittest *Pinus palustris* alone has been able to contend with the condition of fire as it annually occurs over the grassy surface of the Southern forest.

In their earlier stages of growth all other species of Southern trees are not only slow in their growth, but their dying foliage is combustible, their stems and young shoots are bare and unprotected, and their buds and growing eyes are on the *outside*, exposed to the flame of the burning grass and fallen leaves as the fire creeps over the surface of the land, so that with each recurring annual burning all plants which have sprung up in the woodlands since the preceding spring, are overtaken and readily destroyed when the dry grass and leaves take fire in the fall, and are thus perpetually prevented from gaining a foothold and arriving at so advanced a stage of growth as to lift their buds above the reach of flames.

On the other hand, the long-leaved pine shoots up from the spring-sown seed with astonishing vigor, attaining an average altitude of about 16 inches by the time of the occurrence of the winter fires. Its young stem is without buds and eyes on the outer surface, and this surface throughout its length is protected by a dense growth of peculiarly non-combustible *green* foliage that will not blaze except when subjected to much more intense heat than generally results from the slowly burning wire-grass covering the pine forest. The growing bud of *P. palustris* is also at the very top of its stem, closely encased in a thick pellicle of protecting green. Thus this tree is enabled to survive, to become proud master of the situation, and by annually reproducing its species to perpetuate the grand forest of the Southern Maritime Pine Belt.

The truth of this theory of the predominance of *P. palustris* in the Southern pine belt has thousands of practical illustrations in the experience and observation of persons throughout the region in question whose residence has been long enough to enable them to note the results where intervening roadways, farm clearings, and other obstructions have interrupted the annual march of fire in the pine woods. Localities protected for a short time from fire rapidly become covered with oak, hickory, magnolia, dogwood, &c., and become in time "Hammock" lauds. The presence of hard wood underbrush is prohibitory of the growth of *P. palustris*.

The statute-books of almost every Southern State contain enactments prohibitory of setting fire to the woods, and severe penalties are attached to violations of the law. There may be sound reason for such legislation, since great loss of property often results from burning fences and buildings. But viewed from a forestry standpoint we believe the total abolition of forest fires in the South would mean the annihilation of her grand lumbering pineries.

In the absence of carefully collected data we are unable to say authoritatively how long a time is requisite to enable a forest of *P. palustris* to attain marketable proportions from the seed. Our personal observation along the line of the Tallahassee and St. Mark's Railway during the last 40 years would induce us to believe that from 60 to 80 years under conditions existing there would make of *palustris* seedlings trees that would cut an average of 500-ft. board measure, scaled as is now customary in Southern mills, where the methods are wasteful and rarely over 60% of a tree is taken to the saw.

Ex-Gov. Geo. F. Drew, of Florida, a man of extensive lumbering experience, is authority for the assertion that in cutting timber from his extensive holdings in Suwannee and Madison counties in Florida he could take from the forest all pines of a profitable merchantable size and get from the same land as much more of like quality every 20 years.

In connection with the assertion heretofore made of the peculiar fitness of the Mexican Gulf region for the rapid growth of tree plantation, it may be of interest to note some observations of the writer.

On an old plantation in Wakulla county, Fla., now the property of Mrs. Fannie Sullivan, of Sibley, Ills., there is a dense growth of young white oak timber covering, perhaps, 100 acres. These trees are so thickly standing as to have pruned one another of lateral growth, and are tall and tapering, clear of limbs for about 35 feet. We think the lot would now, if felled and hewn, square an average of 8 inches in 30-foot lengths. The ground they grow upon was cultivated in corn during the summer of 1864, and the old corn ridges are still discernible under the trees.

On the Call homestead, near Tallahassee, where the writer was born and has since resided, an avenue of red cedar was set out with one and two-year-old seedlings in 1863-'4. During the summer of 1880 the trees in this avenue, numbering 60 or more, were cut down and converted into fence posts. No exact measurements were made of their size, but the majority of them furnished two cuts post length of 7 feet, and each cut, when split into quarters, made four fence post of dimensions sufficient to admit of an in-cut at bottom and top to receive a 4x2-inch rail for rail and picket fence. The writer has seen rafts of cedar logs of no greater size on their way to the pencil mills at Cedar Keys.

On the same premises, during the memory of the writer, five black walnut trees have attained since 1859 an average circumference of 67 inches five feet from the ground. Thirty-nine water oaks, transplanted in 1858, have averaged a growth in circumference of 9 feet 7 inches, the maximum being 14 feet 3 inches, the minimum 5 feet 2 inches. Forty-one live oaks in 30 years have made an average growth of 7 feet 9 inches in circumference. Five red cedars in 50 years have made an average growth of 5 feet 4 inches in circumference, the maximum being 7 feet 6 inches.

Among varieties of trees, the systematic planting and culture of which in the Gulf coast region might be attended with fairly early profit, where areas are extensive and cheap and the conditions of climate and soil are so conducive to rapid maturity, poplar, ash, wild cherry, black locust, walnut, white oak, red and white cedar, catalpa, and Pride of China, are all kinds that experience shows admirably suited to existing conditions, and are possessed of commercial value attainable in from 15 to 30 years.

The planting of nut-bearing trees as a profitable investment is rapidly gaining favor in Middle and West Florida. Pecans and English walnuts are very popular for this purpose. The income derivable from the crop of nuts is very great per acre. Trees begin bearing the seventh year, the annual product increasing with age.

Wooded pasture lands, with nut-bearing trees overhead, and Texas and Kentucky blue grass, and Bermuda grass under foot, made rich and green by the golden tread of merino sheep and Angora goats, is a realization of the near future from Ponchartrain to Suwannee that will rapidly supersede cotton fields and waste places, and in time surpass even the great fruit-tree culture of Florida.

A proper conclusion of these rambling notes may be an allusion to the thorough fit-

ness of conditions in Florida for the growth of the mulberry and the profitable production of merchantable silk cocoons.

The writer, feeling great interest in the introduction of this industry into Florida, spent a year in Philadelphia studying the subject under the auspices of the Woman's Silk Culture Association of the United States, and has since experimented for several succeeding years in the propagation in Florida of *Morus alba* and *M. multicaulis*, the rearing of silk worms, and the marketing of their product.

Such experience has practically demonstrated the facility and profitableness of the business, and hopes are entertained that in time it may become an established industry among housewives and their child-help, resulting in giving healthful intellectual employment to tender hands that cannot usefully employ themselves in the rougher farm work, and yet add several hundred dollars annually to the earnings of every household. Less than half the expense, care, and percentage of risk and loss attending the ordinary farm care of poultry will result, it is estimated, in many fold the profits attending the poultry interest of farmers' wives. There should be in every orchard a square devoted to growing mulberry shoots, and in every country household a shed-room for cocoons. Six weeks steady attention in April and May will give to any active woman and her family of children from 25 to 100 lbs. of marketable cocoons, worth, when of good quality, about \$2 per pound.

When it is considered how immense would be the aggregated revenue derivable from this simple industry, should every farmer's wife produce only ten pounds annually of cocoons, it is to be wondered that public authority does not hold out some inducements towards establishing the occupation of silk culture.

A very little earnestness upon this subject just at this juncture would lead to grand results in the immediate future, nor do we think the subject disconnected with the purposes of our American Forestry Congress.

FREE LUMBER AND FORESTRY.

BY ADOLPH LEUÉ,

Secretary of the Ohio State Forestry Bureau, Cincinnati, Ohio.

In view of the fact that most, if not all, Forestry Associations in this country did at one time or another very emphatically denounce the tariff on Canadian lumber, and that, as far as I know, all friends of our forests consider this tariff detrimental to the forestry interest of the United States, one might well hesitate to present an entirely opposite view; and I do this at the risk of being called a rank heretic.

Before I proceed to present my view of this important question permit me to state that I, too, was one of those who favored the removal of the tariff on Canadian lumber, and, as a member of the Committee of the Ohio State Forestry Association, appointed to memorialize the Congress of the United States on this subject, signed the memorial drawn by the late Dr. John A. Warder. At that time I was of the firm opinion that the proposed measure would advance the forestry interest of the United States. Among those who favored the removal of the tariff on timber, and who interested themselves in pushing the question with great vigor, were Canadian lumbermen. Many of the most able articles appearing in newspapers published in this country were written or inspired by Canadians. My suspicion being aroused, I began carefully to study journals devoted to the lumbering interest, and, I confess, that from them I learned more about the timber resources of this country than from all other sources combined. The result was, I became a convert to protection, believing—

1. That the reduction or the removal of the tariff on lumber will not lower the price of timber in the United States.

2. That it will tend to a more rapid removal of the woodlands in the more densely-populated States.

3. That it will retard the development of a rational system of forestry.

The claim that the removal of the tariff on lumber will bring down the price of lumber is a very invalid one, because it is the opinion of those who are best able to judge that it will in no way influence the price of lumber. What will be the effect?

In Ohio about ten million acres of woodland were cleared during the last thirty-four years, which is equivalent to about thirty-seven per cent. of the superficial area of the State: and this process of clearing is still going on, because the farmers assert that it does not pay them to keep their land in forests. Part of the timber thus cut is sold, another is used for fence-posts, rails, &c., and the rest is cut into cord-wood. The land cleared is used for pasturing purposes or is turned into plow-land.

If, now, at the present price of timber, the farmer finds his wood-lot or bush, as he calls it, unprofitable, how much more will he find it so when, as the advocates of the removal of the tariff predict, the price of timber will be reduced? It is, therefore,

more than probable that the removal of the tariff on lumber will not retard the destruction of our natural forests, but hasten it.

That, at the prospect of continued low prices of timber, the planting of so-called artificial forests will be entirely out of the question is fairly beyond controversy. All efforts at the development of an American system of forestry worthy of the name will be without effect.

In this country practical forestry, like any other occupation or investment, must rest on the sound basis of a fair profit, and the better the prospects for such profit are the more attention it will receive. The more attention we bestow upon our forests the more secure will be the future prosperity of our country; for be it ever remembered that the wealth, power, and prosperity of nations chiefly depend upon a successful agriculture, and that a permanent successful agriculture cannot exist without the aid of a wise system of forestry.

Instead of reducing, or even removing, the tariff on lumber, it would indeed be a wiser policy to double it, and thus give an impetus to the planting and cultivating of new forests.

PUBLIC PARKS AND PUBLIC FORESTS.

M. G. KERN, ST. LOUIS, MO.

The conditions under which the creation of extensive public parks has been brought about in various leading Western cities appears to a close observer as a striking parallel to those which are encountered by the advocates of public forests.

It seems, then, natural that the results which are attempted by the advocates of the wider conception of forest culture might be obtained in the same manner as we have obtained our public parks.

Public progress is ever dependent upon a leader, in whose wake the masses follow. The rural and suburban improvements indispensable in our day to a city aspiring to metropolitan rank are planned by the few, but quite often in the beginning are bitterly opposed by the larger portion of the population. After much prejudice is combated and lived down, a majority declares in favor of the project. The Legislature of the State steps into the arena at this point and authorizes the city or all the cities of a certain grade, within the borders of the State, to expend certain sums for that specific purpose, to be levied by special taxation.

Why should not the Legislature of a State enact a similar law authorizing counties to plant forests on the same basis, not merely for the sake of experimenting in arboriculture, but for a permanent source of revenue in time to come? How many waste and idle acres could in this way be transformed into valuable forests at a comparatively insignificant expense to the people! The proposition when first placed before the people may not be sufficiently understood in its full bearing on the future public weal, but would open wide the gates for thorough agitation by which public intelligence would ever be the gainer. How many valuable forests, and pleasant, sheltered, park-like surroundings to thriving cities and villages, could in this way be created, and what an impetus would home forest culture thus receive.

The public and charitable institutions of many States are quite frequently endowed or surrounded by extensive tracts of land, which, if not lying waste, in most cases are but poorly cultivated. Where such is the case the Legislature should be petitioned and urged by all honorable means to make an appropriation for arboriculture on these ill-used lands. Thus, in a decade, perhaps, the respective institutions might be surrounded and adorned by stately groves and sheltering forests. A united effort on the part of the friends of arboriculture would accomplish wonders in every State of the Union.

I may mention in this connection a plan which the Missouri State Horticultural Society is vigorously agitating. The State acquired a few years ago a section of most valuable high prairie land, in close proximity to the town of Nevada, and has erected thereon a series of substantial buildings as an asylum for the insane. The Horticultural Society will petition the Legislature to devote 400 acres of this tract to forest culture and ask an appropriation corresponding to the character of the enterprise.

It is intended to raise at the same time a large stock of seedling trees, for distribution throughout the State. When the groves and forests have attained the age to need no longer the fostering care of the Society, the land, "with all the trees thereon and round about its borders," will be returned to the exclusive use of the asylum, which will, by that means, become one of the proudest land-marks of the empire State of the West.

Another subject I wish to direct your attention to.

What has forestry to hope from the action of Congress in favor of experimental stations for the promotion of all agricultural interests of the United States? Will it be recognized as an agricultural interest or be counted out in the division of the funds so

liberally appropriated by the Fiftieth Congress? The answer admits, of necessity, great diversity of opinion, and many of the orthodox scientists and managers of agricultural colleges may refuse to give arboriculture an even chance with agriculture proper. Fortunately, there is a silver lining to the darkness surrounding still this important issue.

The liberal appropriation of Congress to each State will probably have to be expended under certain conditions and restrictions. Congress has wisely created a new division of the Department of Agriculture, a Bureau of Correspondence with the Experimental Stations of the Union, by which harmony of action and a strict accountability of results will soon be brought about, and further legislation of Congress will tend to produce the harmonies of an orchestra and stop the continuous blowing of one horn alone.

The appointment by the Commissioner of Prof. Atwater as the head of this Bureau is regarded everywhere with great favor. The Bureau has at present no power to prescribe or dictate a general plan by which the stations of all the States are to be conducted, and is merely a medium of correspondence and consultation between the different sections of the country. Through this Bureau it will soon be apparent with what material the several stations are manned, and the Bureau will act as a regulator in bringing into proper recognition the various interests equally needful to the development of our country, but not now so regarded. Through it the claims of forestry and arboriculture in general, now largely overlooked, will receive proper attention. Let us consider for a moment what aid might thus be secured towards replacing in time a small part of the valuable forests of former times by the inauguration of a national system of replanting.

Let us suppose that one-fifteenth, say \$1,000, of the annual appropriation to the station of each State were devoted to experiments and tests in tree culture throughout the United States and realize what might be accomplished with even this modest sum. Progress in this direction will seem slow, since we are apt to make all calculation on the basis of big crops and quick returns; but time and intelligence will solve this problem in due season, and the solution may be nearer at hand than we anticipate to-day.

FORESTRY AND NATIONAL WELFARE.

BY MARTIN CONRAD, CHICAGO, ILLINOIS.

The first provision that was made by the all-wise Creator for the existence of mankind upon the face of the earth was to plant a garden with every kind of tree that was pleasant to the sight and good for food. It was ordained by the Omniscient that trees are essential to the life, comfort, and happiness of his creatures, and no people can flourish who ignore this decree.

I believe in trees; I believe in forests; and I believe that no government can remain a power among the nations of the earth whose people do not protect and foster them. The forests of Palestine and Persia were destroyed, and, as a consequence, the people sank from a high state of civilization to barbarism, and famine desolated the fertile regions which were the cradle of the arts and sciences when Jericho was the "City of Palm trees."

Around the site of this historic city there is not now a single palm. The rich plain, where once waved a sea of golden corn, is entirely deserted, save by roving Bedouins, who camp in its fields and roam over its vast expanse in search of plunder. The terraces, once cultivated for the support of a teeming populace, are parched and desolate; the cities that crowned every eminence are in ruins; the equilibrium between the animal and vegetable kingdom is lost; and the land to-day is rich only in the history of its former magnificence and grandeur.

The dire consequences of the disafforestation of these fertile regions in Asia, and the lesson which the improvidence of this people should have taught succeeding generations, was entirely lost upon the rulers of Europe. It was not their love of country, nor yet patriotic forethought for its future welfare, that saved a portion of that fair land from a similar fate, but rather the result of their sordid selfishness and cupidity, that proved in after years not only the salvation, but the crowning glory of their country.

In England, Germany, and France, for instance, they delighted in the chase, and gratified their passion for this pastime even to the extent of depopulating large tracts of country, which were set apart as safe preserves for wild animals to be slain only by royal hands. And lest the people, who in many instances had thus been deprived of their freehold lands, should in any way attempt to interfere with this royal sport, they were hedged about with the most cruel and inhuman laws that ever disgraced the pages of a statute-book.

As late as the eleventh century we find that in England the penalty for killing a stag, whether in the forest, on the public highway, or even on the offender's own premises, was the loss of an eye, and for a second offense the culprit was punished with total blindness.

The incidental and totally unconsidered result of these stringent laws was that the forests received a measure of protection based solely upon their value as an adjunct to the chase, and not because there existed at that time the slightest appreciation of their importance from any other standpoint. Thus unconsciously did they become benefactors of their country, for while the forest sheltered their game it also equalized the humidity of the atmosphere, created springs, controlled the flow of their streams, and protected the moisture of the ground, so that when it was found in the sixteenth century that these countries were well wooded, while at the same time there prevailed a great dearth of timber for fuel and other economic purposes, a more enlightened people found no difficulty in growing trees to supply these necessities.

It was at this period that writers and savants, for the first time in the world's history, agitated the subject of arboriculture as a measure of political economy, and we find, as a consequence, that plantations of forest trees to a limited extent were made in England, while Germany and France began a system of forestry directed chiefly to the care and protection of their remaining open forests.

A century later an increased demand for timber gave a new impulse to arboriculture, and the publication of John Evelyn's "*Sylva*" at this time created such a taste for the science in England that large land-owners, as well as the government, became sufficiently interested to establish nurseries for forest trees, and a system of re-forestation was begun, which has been developed, until to-day the hills that were bleak and the wastes that were barren are shaded with forests in which the foreign trees far outnumber those that are indigenous to the soil.

The landscape of Germany has been changed and beautified, by careful management and cultivation, until the forests of that country and her forestry system are superior to all others, and the schools devoted specially to this study have justly earned the right to be called the *alma maters* of this interesting science.

And while her two most prominent neighbors were thus alert to the importance of the question, the French nation was neither idle nor indifferent. On the contrary, she kept full pace with the others, and such was the harmony of sentiment between these three countries upon this subject that with all the vicissitudes of international warfare, changes of boundary lines, and other disturbing events they were entirely in unison on the perpetuation of their forest lands. On that one point their interests were in common, and were guarded with greater solicitude than is manifested in America to-day under far more pressing circumstances.

In sharp contrast to the flourishing condition of these countries is the state of affairs in Spain, whose rulers and people alike preferred the savage sports of the arena to the pleasures of the chase, and, as peaceful groves and forest glens could contribute nothing to intensify the horrors in which this country delighted, they held no place in the estimation of the people; so that the forestry interests were left to take care of themselves, with the usual deplorable results.

The kingdom of Spain was at one time the most opulent of the Powers of Europe, but its decline dates back to the time when the destruction of its forests began; the climate became arid; the streams refused their life-giving flow to agriculture, and the broad lands that once yielded an abundant harvest had to be abandoned for lesser fields, situated nearer the sources of streams and in the mountain declivities. No forests had been reserved, as in the other countries of Europe, and when, in later years, they sought to remedy their great mistake by following the example of their neighbors, in the work of reforestation, they discovered, as one writer puts it, that while trees induce humidity, it first requires humidity to induce the growth of trees. Confronted by this important law of Nature, they saw their well-meant efforts rewarded with only the most meagre and discouraging results, and realized then that the lesson taught them in the merciless school of experience had come to them too late for the relief of their country. They had waited too long; the point of climatic equilibrium had been passed; and it is doubtful whether even the matured experience of Germany in this science could successfully cope with the alternating drouths and floods that now prevail.

As another example of the calamitous results of disafforestation, I would call your attention to the present condition of Russia—a country blessed with an immense forest area—whose people, unrestrained by any considerations of prudence, have continued their wasteful incursions upon their woodlands until the government, becoming alarmed at the frequency of famines in the best districts of the empire, ordered an official investigation into the cause.

The results proved beyond all question that these disasters were entirely due to climatic changes brought about by the denudation of their forest lands.

This report served to arouse the authorities from their apathy, and resulted in the adoption of various protective measures, among which we find that the Ministry of State Domains offers large premiums, by Imperial command, for planting trees and cultivating forests on peasant lands as well as on proprietors' estates; and thus they hope to replace the growth of centuries with young trees.

Should these efforts fail, it requires no spirit of prophecy to foretell the dire consequences threatening that great empire.

The precedents furnished by these older countries must make it clear, to every thinking mind, that the best interests of our country demand the immediate enactment of laws that will insure the protection and proper administration of the entire forest area of our public domain: and as the conservation of our national welfare is the chief function of Congress, the lessons to be deduced from the experience of others should be as valuable to that body in shaping the affairs of State as they are, with proper prudence, the safest guide for the individual man of business.

Reasoning from this standpoint, we find that the nation is being robbed every year of enormous quantities of timber, and by adding to this the amount destroyed by fire, the total may be set down at ten millions of dollars, ten per cent. of which sum would suffice to inaugurate a system of forestry competent not only to prevent this loss, but to insure a forest covering to the slopes and crests of the Rocky Mountains and the Pacific Slope, where this forest covering serves as a vast natural reservoir for the accumulated rains and snows of winter, and forms the fountain-head of all streams, and whose value can only be measured by the agricultural product of the valleys and tablelands below them.

The actual value of the timber, therefore, sinks into insignificance when compared with the important function which these forests subserve in this manner, and yet man, in his selfish greed for immediate wealth, is denuding the mountain-sides, unmindful of the consequences, which are already manifesting themselves in the agricultural districts by a superabundance of water early in the year, and an insufficiency during the summer season to mature the growing crops. This was the case in some sections of Colorado during the present year, and had it not been for an excess of unlooked-for but opportune rains, a complete failure would have been the certain result.

As these lands are non-productive and valueless without proper irrigation, the situation has certainly reached a crisis which justifies the gravest fears, and yet in my travels through these regions last summer I did not hear a single suggestion looking towards reforestation, or even to the protection of the wooded slopes against further spoliation. Instead of this, Congress is to be asked to construct and maintain a series of artificial reservoirs to restore a proper water supply, and, considered in all its bearings, I do not hesitate to pronounce this the poorest remedy that could be devised; for, unless the advocates of this plan can also suggest means to stay the elements at convenient stages, they will find, as is shown by the experience of France, that these dams and reservoirs are not only enormously expensive, but positively create even greater dangers to human life and property than those which they are meant to remedy.

In view of these conditions, need any one ask further what must be done to maintain the fertility or increase the productive area in these districts? Do not science, observation, and precedent clearly indicate the only safe and proper course to pursue?

Let the strong arm of the Government be stretched forth in the philanthropic work of reforestation, so that our great river-basins may be tilled in peace, freed from the dreaded devastation of the annual flood, and the valleys of the boundless West will flourish and blossom with the riches of the soil.

Where States are fortunate enough to be the owners of lands, the position of their respective legislatures is relatively the same as that occupied by Congress toward the public domain; hence all that has been said of the duties of the latter may be applied with equal force to the former.

The State of New York is one of these, and its 700,000 acres of forest lands have been pillaged at will, ever since the organization of the State, until, after much agitation, three Commissioners were appointed in 1885 for the purpose of taking charge of these lands, and enforcing the law in regard to forest fires in every part of the State. The result, two years later, was an absolute immunity from fire on State lands, the complete arrest of all trespass, timber-thieving, and other encroachments, besides the recovery of \$14,000 for timber illegally cut, which amount covered nearly one-half of the total expense incurred by the State in this movement.

This example of active interest and gratifying progress might be profitably imitated by the great State of Texas, whose vast empire, stretching westward from the Brazos river, is altogether treeless; whereas if but a portion of the immense tracts owned by the State within this *demesne* were set apart for forest preserves and planted with trees, their very presence would be sufficient to attract the much-needed settler, develop the still latent resources of the country, and confer benefits which would make themselves felt in every portion of the State.

Thus it will be seen that the problem of forestry in the United States varies according to location. It devolves upon the people of the prairie States to plant trees; upon those of the mountain regions to protect and manage the forests; in partially timbered localities to preserve what forests they have left, and make them as productive as possible, while those favored with ripe original forests should see to the proper utilization of the timber without impairing that which is the rightful legacy of generations yet to come.

It is the duty of every State to furnish the means by which its laws for the prevention of forest fires may be enforced, as the loss to the country from this cause alone amounted to ten millions of acres of woodland during the last census year. On this immense area the property destroyed amounted to twenty-five and one-half millions of dollars, not including the value of embryo forests that have also been swept away, thereby dooming the land to weeds and brambles for centuries to come before enough mold will have accumulated for tree-growth.

The actual expense necessary for the maintenance of a proper system of protection sinks into utter insignificance when compared with such loss as this, and therefore the mere cost should not be a bar to the necessary State legislation on this subject.

The adoption and observance of Arbor Day is significant of the interest taken by the several States in this matter, and as the laws now on the statute-books are at best only tentative, and not sufficient to interest the land-owner, it is to be hoped that the same spirit that prompts the ceremonial observance of this day may lead to more favorable legislation for the encouragement and promotion of practical efforts in forestry. I do not mean to argue that forest plantations on private estates actually need such assistance to make them profitable, but inasmuch as they tend to modify the climate, prevent extremes of temperature, furnish protection from violent winds, and in every other way confer benefits in which all share alike, it is in my opinion only fair that the work should be popularized and encouraged to a certain degree at public expense.

In view of these facts, every one who plants trees, labors to improve his forest conditions, and counteracts every tendency towards deterioration, is a public benefactor; but there is also a mercenary side to this question which will probably succeed much better as a popular incentive than mere suggestions of philanthropy or sentiment. If every land-owner could be made to realize the fact that our forests yield a revenue to the country immensely greater than the combined wealth of all our mines, surpassing even the value of our great corn crop by nearly 200 millions of dollars, and above all that this enormous timber-harvest, which for the last census year amounted to 700 millions, involved a sacrifice of forest wealth, chargeable to carelessness, to nearly one-half as much more, it would be a powerful incentive to reform; and the improvident greed which, for want of a better market, destroys a two-dollar tree to get a 35 cent railroad tie, would become a thing of the past.

To demonstrate the financial injury that is inflicted upon the present generation by direct waste of material, and the wrong that is being done to posterity by the destruction of young growths and the extinction of the germs of future forests by domestic animals, should be one of the first duties of every Forestry Association.

Of course, no one wishes to see the country relapse into a wilderness, nor to circumscribe or interfere in any way with the proper use of the forest product; but it is incumbent upon every one to practise economy in cutting; to utilize all that is cut; to make the material last as long as possible in its varied uses; and above all, to maintain the equilibrium of supply by planting young trees and fostering the young growths, to replace in due time what is being taken away.

In treating upon this subject on a former occasion, I demonstrated that systematic cultivation of useful forest trees could be made profitable, by figures which were based upon the extremes of maturity. I now propose to illustrate that an unlimited amount of such forest products may be annually marketed, to supply a staple demand in my own line of business, at a very fair profit, in less than 40 years from date of planting.

I am aware that scientists refrain from these calculations for "lack of precedent," but I take the ground that, in Illinois at least, trees will grow if half cared for. An experience of nearly a quarter of a century in handling lumber teaches me that from thirty to forty years will produce the required growth under the most ordinary conditions, and, as the values employed in the following estimates will be just what is being paid for such material in Chicago to-day, it follows that my conclusions must necessarily be as far removed from empty theorizing as any business calculation involving a like number of factors.

In the first place, the very best timber yet discovered for wagon hubs is the much-abused Bois d'Arc or Osage Orange, which possesses the peculiarity of not shrinking or checking to any appreciable degree while undergoing the process of seasoning. The timber is firm, elastic, and very durable, but, as it is almost unobtainable from natural sources, its use is necessarily limited.

That it can be grown to trees of ample dimensions was seen this year in the factory

of Schuttler & Hotz, Chicago, where quite a quantity of farm-wagon hubs were made from this timber, which had grown without cultivation to a sufficient size for this purpose on Illinois prairie soil in twenty-two years from the seed.

To illustrate what profits would accrue to the owner of a plantation of this valuable timber, let each acre represent a product of only 150 trees, which will readily yield 450 sets of hub-blocks, worth seventy-five cents each; giving us a total of \$337.50 as the value of this portion of the crop, while the residue may be made to pay all expenses of cutting and marketing by utilizing it for paving material. For this purpose it is pre-eminently suited, since it is as impervious to decay as white cedar, while far surpassing the latter in hardness and durability. Pavements of this wood have been practically tested in the city of Dallas, Texas, where several years of hard service, under the heaviest traffic of the main streets, scarcely made an impression upon its surface, and the blocks were, to all appearances, as sound as when first put down.

A Bois d'Arc plantation, thus utilized, may therefore be safely credited with an annual increase averaging at least \$8.44 per acre, while in Texas and other portions of the South, where it is indigenous, it would easily exceed the above figures when put to the test of actual practice.

But while the Osage Orange has thus proven its right to rank with the most useful of our timber trees, there are other varieties which will show equally encouraging results when cultivated for the purpose of meeting the urgent demands from the manufacturing world.

Thus, in districts further north, a systematic cultivation of the white oak, for the production of what are technically known as "second-growth" spokes, would not only prove a valuable source of profit, but would tend to relieve another great and growing necessity in my line of business, as this material is becoming scarcer every season, because of the immense quantities that are cut, not only for home consumption, but for export to foreign countries. It is a fact that American forests furnish the bulk of the spoke-material used in European vehicles, and notwithstanding this additional drain upon our resources, the trees that *could* furnish such material are cut for railroad ties before they are large enough to be utilized for spokes. The consequence is that the billets that will work to the regulation size (1½x3 in. x28 in. long) are now worth in the Chicago market \$20.00 per 1,000, and unless something is speedily done to check this growing scarcity one of the most important branches of the wagon-maker's business is doomed to suffer irreparable damage.

Whether the oak can be cultivated with profit for this and kindred purposes I will leave you to judge from the following estimates, which are based on figures sufficiently conservative to be safely relied upon. A forty years' growth of white oak will readily produce material enough for 170 sets of spoke-timber per acre, worth \$1.14 per set, and hubs to the value of \$25.00 more, making a total of \$216.80; but the more proper method of management would be to cut out only every alternate tree at the end of forty years and let the remainder stand as forest until fully matured at eighty. Allowing two trees for every thousand feet of lumber, at only \$16.00 per 1,000, the results would net us \$109.40 from the first instalment, and not less than \$600.00 from the later crop, making an average of \$8.87 annual increase per acre, since the residue will pay the expenses of cutting and marketing. But, encouraging as these figures are, it should be borne in mind that the actual price of such material as the above is \$25.00 per thousand in Chicago to-day, and that, judging from present indications, it will be more likely to bring three times that price eighty years hence.

Another valuable tree, belonging exclusively to America, is fast following the black walnut on the inevitable road to extinction, and yet there is none whose product, if cultivated, might be more quickly marketed than the hickory. Wherever special elasticity with strength is required, as in wagon axles, carriage-spokes, hammer, pick, and tool-handles, this timber is almost indispensable, and in the vast diversity of its uses is worked up at all stages of its growth, so that the product of every periodical thinning out of such a plantation is immediately available in one shape or another at good prices. From ordinary hoop-poles up, so varied are the uses to which it is put that it is impossible to estimate the value of the periodical harvests which would precede the final or matured crop, while the latter, in its turn, would at least be equal to that of the two species which I have already estimated.

It is hardly necessary, however, to enter further into details respecting the varieties of other trees equally necessary to the world of industry which might be cultivated with similarly profitable results. Even the ash, that "unsociable tree," which is never found in groves of its kind, and whose profitable cultivation would probably depend upon its being scattered at intervals throughout plantations of other kinds, is of such pregnant value to the manufacturing industries of this country that its extinction here would be most keenly felt. It is another of those woods which, while indispensable for certain specific uses in which no other wood can well take its place, is also an ornamental material of such high value for furniture and interior decoration that it is cut down at all periods of its growth.

In the course of this Congress, great stress has been laid upon the prospects for an early extinction of our forests, and yet how little does the general public realize the imminence of the catastrophe which so soon will culminate in the white pine regions of the Northwest. Under the terrific onslaughts of the concentrated forces of modern machinery, the stately evergreen is rapidly disappearing, and the worst feature of this slaughter is that the white pine, after such wholesale destruction, never renews its kind, and never recovers the lost ground; but, like the aborigine, seems to vanish before the approach of civilization.

Ever since the settlement of the Lake region, the vast pine forests of Michigan and Wisconsin have been drawn upon with unrestrained hand, and have attracted a concentration of capitalized interests which has apparently exerted all its efforts to their utter extinction within the shortest possible time. No one will deny the right of mankind to a proper use of the forest product, but those who have taken it upon themselves to supply this demand have much to answer for in the enormous waste of material which attends their methods. It is estimated that fully one-third of each year's cut is a total loss through reckless and inexcusable waste, which might have been prevented by a conservative system of forestry as practised in Europe, and, by prolonging the timber supply, would at least have postponed the inevitable day of its total extinction.

The principal headquarters of the white-pine lumber trade of the Northwest are at Chicago; and were I to illustrate the situation there to-day by the parable of the goose and the golden eggs, it would be doing only justice, though not very flattering, to the otherwise keen and enlightened business men composing the great Northwestern Lumbermen's Association of that city.

It is not so very long ago that the vast extent of wilderness from which they were drawing untold wealth, and which, like the coal beds and gas-wells of Pennsylvania, had hitherto been an unknown quantity, suddenly became measurable; and at a recent meeting of lumbermen in Chicago the dilemma of the day presented itself in all its menacing proximity. It was estimated that while in 1840 there were, in the State of Michigan alone, 150 billions of feet of pine timber, there is not now much over 15 billions, or enough for two years' cut, were it all taken out at the present rate. In Wisconsin the situation is relatively the same, except that its present greatest area of primeval forest is subjected to a much swifter depletion, because of the greater demand and the increased modern facilities for cutting.

It was therefore conceded that the time was not far distant when their operations must be transferred to the South, where, in anticipation of such a necessity, large tracts of forest lands had already been acquired for the purpose within the past few years. This fact alone reveals the impoverished condition of the Northern lumber districts more forcibly than pages of statistics could do it, and while such a step may prolong the business for a time, the final results to the people of all sections will be none the less disastrous, unless the present methods of operation are very radically improved. Under our modern system of lumbering, with its inordinate and inexcusable waste of valuable material, gigantic in its destructive efficiency and urged on by the ever increasing demand for the product, the forests of the South will vanish with frightful speed before these deadly inroads, and the land will soon be doomed to suffer the penalties with which outraged nature is already threatening the North.

It is gratifying to know, however, that the thoughtful and intelligent people of our country are awakening to the urgency of the questions in behalf of which this Congress is here assembled; to know that there is hardly a State but what has an Association of some kind within its borders advocating the cause of forestry; that much encouragement may be expected from individual efforts, and that, notwithstanding the tremendous drains upon our forest resources, they are for the present still capable of yielding a large material product, until an effective system of redemption can be brought into operation. The opportunities of the hour must not be permitted to pass us by: for what the 17th century was to European forestry the 19th is to that of the present day with us, and if we are to profit by the warning example of Spain, it will not do to neglect this duty until our timber area shall be exhausted beyond the power of human intervention to recover it. It is also satisfactory and encouraging to find that practical demonstrations of the possibilities of timber cultivation are beginning to manifest themselves, and that the voice of the press is everywhere heard in behalf of the movement which so vitally concerns our country's welfare.

A most remarkable example of practical results was exhibited at the Kansas City Exposition a few months ago, in the shape of a substantial farm wagon, complete in every detail, constructed by the well-known Peter Schuttler wagon factory at Chicago, from twenty kinds of wood raised from the seed on the prairie farm of A. R. Whitney, at Franklin Grove, Illinois, in less than forty years.

This unique display not only reflects great credit upon the exhibitors for their evident interest in the cause of forestry, and for expressing it in so practical a form, but, in point of fact, it stands unparalleled as an example of the possibilities of forest cultiva-

tion in this country. Being the first illustration of the kind ever seen on this Continent, it not only awakened great enthusiasm among all friends of arboriculture, but called forth the warmest praises from the newspaper press of the Western States, which, as a rule, had already displayed more or less interest in the question of forestry, and, therefore, welcomed it as a valuable demonstration of the cause which they had been advocating, one journal in Kansas City culminating its efforts by an offer of premiums to the amount of \$550 in cash as a stimulus to tree planting in Kansas.

The value of this remarkable piece of work, judged by its direct results, can hardly be overestimated, since it enlisted the powerful assistance of the press, aroused public attention, and, above all, appealed so directly to the popular and practical side of the question as to deserve honorable mention.

In view of such disinterested works as this, which are the index of progress in our cause, and which are worthy of the emulation and encouragement of all good citizens, it should not be charged that the Russian people's treatment of their forests finds a parallel in America, for such is far from being the case. It would, indeed, be a surprising anomaly if the superior intelligence of our land-owners, in whose ranks are many of our profoundest thinkers and ablest legislators, and whose broad acres were acquired, as a rule, by their own industry and thrift, should not have advanced on this point beyond the Tartar peasant or the emancipated serf, or that it should first require a Russian famine to awaken this government of the people to the vital importance of the forestry question to our national welfare.

Its laws are simply the expression of the will of the community, promulgated for their own welfare, and every enactment, to be of practical service, must have behind it the popular intelligence which demands its enforcement. As a stream is never higher than its source, so every government is merely a type or symbol of the people from which it has sprung; and all legislative action has its roots in some urgent need of the hour. To awaken proper interest among those from whom the first impulse must come is the purpose of our Congress of Forestry here to-day, since no one can judge better of the necessities of the case than those whose vocations and interests are directly affected by its present conditions.

On the other hand, we have before us the task of correcting the erroneous though popular belief in the inexhaustible resources of our country, since it begets that dangerous indifference which has already cost us the best portion of our forest wealth. It is the wonder and surprise of the Old World that our country, after supplying its sixty millions of people with profuse abundance, can regularly show a surplus of 10 per cent. of the value of all its immense product. This country is now justly accounted rich, but its wealth has been accumulating ever since the beginning of American history, and duty requires that we shall protect the sources of this prosperity to be handed down unimpaired to future generations. Yet with all our profusion, we are just beginning to learn that our resources are not to be considered inexhaustible, and that after all no country can have much more than its proper proportion of the world's wealth. We are never more than a few years removed from starvation, and an Egyptian famine would not have to run its seven years' course before we would be thrown upon the charity of foreign nations.

Let us now review the various examples of national calamity and progress, past and present, which I have cited, and let us decide whether, in the light of all this experience, we are justified in further ignoring or even temporizing with the questions at issue. Back in the early dawn of history we find the luxuriant land, where once stood the cradle of the human race, gradually being robbed of its rich groves and forests, shorn of its vine and fig tree, and stripped of the olive and the palm, while to-day its ruined temples and crumbling columns almost buried from sight beneath the sands of the desert are all that remain to attest its ancient glory. And we find, in later years, that the historic kingdom of Spain, upon whose realms once "the sun never set," and whose fertile fields formed the granary of ancient Rome, where learning, art, and chivalry flourished in harmony with industry and commerce, is to-day reduced to comparative penury through the culpable avarice of man.

We see the vast Empire of Russia, almost at the eleventh hour, putting forth spasmodic efforts to regain its forestal equilibrium, to save itself from the impending doom to which it has just awakened; and as an offset to all these, we have the prudent examples of the German, French, and English nations, whose "eternal vigilance" in the protection and cultivation of their forests is the price of their present prosperity, and who have been wise enough to profit by the experience of others. Can the great Republic of America, at this critical stage of its imperilled forestal conditions, afford to ignore these examples any longer? Every thoughtful citizen will admit that only the blindest folly could excuse further inaction; the time has come for active work, and our first steps should be the careful husbanding of our remaining timber resources, and immediate legislation to that end. Every friend of forestry should devote his personal efforts towards bringing this about, and what little I can do in the cause will

be to demonstrate to the people that nothing need be sacrificed by individual efforts in the planting and cultivation of trees, but that, on the contrary, the rewards of Nature for any such investment are far more certain than in the ordinary operations of agriculture, and that the grand work of restoring the noblest growth of the vegetable kingdom will surely earn the blessings of generations still to come.

FOREST FIRES IN NORTHERN CANADA.

BY ROBERT BELL, OTTAWA, CANADA,

Assistant Director Geological Survey.

Northward of the deciduous and mixed forests of Southern Canada a vast belt of conifers, about seven hundred miles in breadth, stretches for four thousand miles from the eastern coast of Labrador to the Rocky Mountains, and continues beyond them into Alaska. The northern zone of this belt consists of black and white spruce and tamarac, but as we go south these become mixed with Banksian pine, balsam fir, and, in the east, with white cedar, and, finally, with red and white pine. Excepting near the verge of the forest, there is also a greater or less mixture of aspen, rough-barked poplar, white birch, and the various northern willows, but in a general way this great belt may be described as a coniferous forest.

Notwithstanding its immense extent, it may be said that fire has run through every part of it at one period or another. Forests of this kind are peculiarly liable to destruction by fire.

The trees are comparatively small, and when they do not stand closely together their branches grow all the way down to the ground. The open spaces, no matter how rocky, are covered by reindeer mosses, which, in the summer time, are as dry and inflammable as tinder, while the deep carpeting of the yellow mosses among the trees themselves is equally dry and helps to give body to the flames.

The Indian hunter or wild Indian of the North, knowing how destructive forest fires are to the animals on which he depends for food and fur, takes all possible care to prevent them, yet if one ascends a high hill in any part of these regions so as to obtain an extensive view of the country he will find the normal condition of the woods to be "patchy," or to consist of areas of second growths of various ages mixed with others of older timber. The latter may have attained to the full growth and yet not represent the original forest, as it has probably sprung up on ground which had been burnt over at a time more remote than would represent the life of any of the trees standing upon it. The writer has crossed the entire breadth of our northern forests in many parts and has found the above condition to prevail everywhere.

Knowing the care which the Indians have always exercised, and the fact that the country has not been invaded by white men, the question arises, What has caused these fires which have in turn swept over every part of this enormous country, and not only once, but again and again, since a very early period? My answer is that the conditions which we find in our Northern woods could not otherwise have been attained. These fires have had an effect on the formation of the soil, on the rotation of crops of trees, so necessary to their healthy condition, and on the dispersion of seeds.

We have both direct proof, and also the evidence of the trees themselves, that forest fires have originated without human agency, and that they have been going on ever since the present species of trees existed, if, indeed, they have not played a part in providing some of their specific characters. Lightning has been the commonest cause of these fires, although in some cases they may have originated from the spontaneous combustion due to the decomposition of pyrites, which is known to have set fire to beds of lignite in the Sashkatchewan region.

In the Northern States and the inhabited parts of Canada it is not uncommon for lightning to strike barns and houses and to set them on fire in the hot months of summer. This is the season when our Northern forests are dry and ready to burn, and we should naturally expect similar accidents to occur among them with at least equal frequency, in proportion to area. Examples have been observed in this region where the fire which has destroyed a large area has been traced back to a tree which had been struck by lightning. With an experience of over thirty summers spent in these woods, I only once actually witnessed a case of this kind. The lightning on this occasion was plainly seen to strike the brink of a wooded bluff near Red Rock, on Lake Superior, and to set it on fire. Owing to the very small number of human beings in these regions, the chances of these occurrences being witnessed are very few as compared with civilized regions; yet the Indians tell me that they frequently happen. On several occasions I have found forest fires (still of limited extent) burning in totally uninhabited regions and where it was certain that no travellers could have passed for a long time before these fires begun. Among examples of this phenomenon which could be

named two were observed on branches of the Albany, one on the Attawapishkat, to the north of it, and one on the Sturgeon river, near Lake Nipissing.

Referring to the evidence afforded by the trees themselves that forest fires are natural phenomena, I shall mention the case of the Banksian pine. The cones of this tree are hard and remain closed as long as the tree lives. The older ones become weathered and covered with lichens, often indicating great age, still adhering firmly to the branch. The tree may fall down and rot and the cones drop from the decayed branches, yet they will not open. But should the trees become scorched by a forest fire, they will immediately gape open and the healthy seeds will become scattered far and wide by the wind.

It sometimes happens that a second fire follows a previous one after the lapse of a few years. The first conflagration kills the trees and consumes all the foliage and twigs, but leaves the charred trunks and branches standing. It also burns off the moss and much of the loamy soil. In time the branches fall off, the smaller roots become rotten, and a gale of wind some day levels all the trunks to the ground. This is called a "fire-fall," and the prostrate trees cover the ground so completely that it is very difficult for the explorer to force his way under or over them. The second growth may have sprung up before it happened or it may begin to push its way through the tangled mass of fallen trees, rendering it almost impenetrable. Should another fire not occur, the second growth, consisting of deciduous trees, will attain its full size, and the fallen conifers gradually rot and disappear. But should a second fire occur during some dry summer, everything is swept away, including the upturned dried roots, which burn even more fiercely than the trunks and branches. The young second growth is entirely destroyed, and even the loamy part of the soil which may have escaped the first fire, including all seeds which may not yet have germinated. Only the scanty inorganic portion remains, heavily charged with the ashes of the wood and the loam. It is on ground thus prepared that groves of Banksian pine spring up and flourish. The seeds must have been scattered upon it after the second fire, which had so completely destroyed everything organic. The ground thus left remains almost bare for a few years, but at last it becomes pretty well occupied by the young pines of different ages as if the sowing process were a gradual one. A few spruces and other trees also spring up. The reason why the Banksian pines are the first to occupy these lifeless areas may be due to the comparative lightness of their seeds and their extent of wing, enabling them to be carried greater distance in the wind or to their finding the excess of potash congenial to their development. They grow quickly, and in twenty years have attained a height of thirty feet and upwards, while some of their trunks are as thick as a man's thigh. By this time their branches bear a good crop of fresh-looking cones. I have never noticed a case where the seeds of this species germinated within a buried cone, as often happens with the spruce, balsam, &c., resulting in tufts of young seedlings, and all my observations go to show that fire is a necessary condition for the diffusion and maintenance of this tree in the manner above described. The same agency no doubt aids in scattering the seeds of other conifers. It is a well known fact that after a fire has destroyed a coniferous forest the growth which succeeds usually consists principally of deciduous trees. In the country under consideration these are aspen and rough-barked poplars, white birch, pigeon cherry, and willows.

After the vegetable loam has been burnt out by a forest fire, a long time must elapse before the soil regains an equal degree of fertility through the falling of leaves and the decay of generations of the small trees which follow, supposing that no new fire occurs to destroy again the accumulated mold and throw everything back to the sterile condition following the original double fire. In the end an increased fertility is probably reached, as the fires and the turning up of the root-bases of the trees all tend to disintegrate the rocky surface.

The length of time which has elapsed since a forest fire cannot be accurately ascertained, even if we could determine correctly the age of the second-growth timber, as the new crop does not always start up immediately after the fire. In cases where the dates of such fires are known they are found to be several years further back than would be supposed if we judged solely by the new timber. The following is the course of events after a fire has run through a tract of the full-grown northern coniferous forest, the fires always occurring during the driest part of the summer: In the next spring weeds and bushes (raspberry, huckleberry, red elder, &c.) begin to spring up and partly occupy the blackened ground. These increase for two or three years, and as they die out are gradually replaced by the poplars, white birch, pigeon cherry, willows, &c., with a few conifers. The willows and pigeon cherry are short lived. The poplars attain their full size and decay in about seventy years, and the white birch shows signs of old age in less than one hundred years. In the meantime the proportion of conifers is constantly increasing from new individuals springing up, so that by the time the deciduous trees have died out the ground has become completely occupied by the former. The shade afforded by the latter causes the trunks of the spruces, tamaracs, &c.,

to grow tall and straight. It may be here remarked that in the northern regions referred to the tamarac grows everywhere on the dry ground, along with the spruces, poplars, &c.

From a very extensive personal knowledge of the condition of the forests of Northern Canada, I am able to state that fires have become more and more frequent as we approach the present time. The areas of the "brulés" of different dates may be said to be greater in proportion to their recentness. Various causes may be assigned for this increasing frequency of forest fires. The starting of a fire by the Indians of more than a hundred years ago, or before the introduction of modern methods, must have been a somewhat difficult matter. They probably obtained sparks by striking together pieces of iron pyrites as the Eskimos do at the present day, or ignited dry pounded woody fibre by means of wooden friction machines worked by a bow and string; and occasionally they may have availed themselves of fires originated by lightning.

The most primitive Indian families I have met with paid great attention to keeping alive the fire they possessed, and carried it on their travels in old kettles, fed at frequent intervals by little dry sticks. The means of obtaining fire have been rendered much easier by the introduction of steel to be used with flint and punk, and of gunpowder by which to ignite rags, &c., in their flint-lock guns, but above all by lucifer matches. The Indian, or for that matter the white man, who is fortunate enough to possess a stock of matches, when in the woods, very often avails himself of this easy means to make a smudge to keep off the mosquitoes, to light his pipe, dropping the burning match, or to make a little fire in order to boil his kettle and refresh himself with a hot drink. The number of fire-setting travellers has greatly increased in comparatively recent times. These include fur traders, missionaries, surveyors, explorers, prospectors, &c. and, nearer to civilization, railway builders, common-road makers, lumbermen, bush-rangers, and settlers.

A fire may be set at a time of the year when it will not run, but it is astonishing how long it will smolder in the deep moss and under logs and roots, until after weeks, or even months, a dry time comes and a favoring gale of wind will fan it into activity and cause it to burn up a whole country side. The heaviest rains and the snows of a whole winter sometimes fail to extinguish or smother these smoldering fires.

In the course of my travels, during the last twenty summers, in the country between the great lakes of the St. Lawrence and James' Bay, and between the Winnipeg basin and Hudson's Bay, forest fires were raging in some part of the area traversed each year, and indeed they may be said to be almost chronic. In all directions tracts of greater or less extent are burnt every year. We would frequently travel for long distances on rivers and chains of lakes along whose banks and on the hills and level lands beyond them, as far as the eye could reach, nothing could be seen but the naked and blackened trees left by the fires of the same or previous season; or it might be the equally dreary gray or bleached and shiving trunks remaining from the fires of previous years, and from which all the bark had dropped off. Even many miles away from one of these fires the smoke would be so dense as to completely hide the shore and islands of the lakes we were passing through, so that we were obliged, as it were, to feel our way along. On these occasions it became impossible to carry on surveying operations, which had to be either abandoned or left for a future opportunity. The sun in the cloudless sky above would appear only as a dull red ball; burnt leaves and thin films of ashes would settle slowly to the earth like large flakes of snow, and the thick smoky air, after a time, became unpleasant for respiration and depressing to the spirits. This state of things might continue for days, but in the course of a few hours, a change in the wind, especially if followed by rain, might clear the atmosphere and we would be able, for the first time, to view the country into which we had penetrated blindfold.

Should one of these fires occur early enough in the summer, the newly killed trees are quickly attacked by the boring beetles, but if late in the season, the borers operations are mostly postponed till the next year. These insects, finding such constant and almost unlimited feeding grounds, swarm in the "brulés" of the great coniferous forests of the North, and here, in a still evening, the creaking noise of the millions of their larvæ may be heard for considerable distances in all directions.

Taking the whole of the great region last referred to, it is probably not too high an estimate to place the recently burnt portions at one-third of the entire area and the portions covered by small second growths at another third, leaving only one-third as original forest and large second growth. When we consider the highly inflammable nature of these forests in summer and the constant danger to which they are then exposed, it is a wonder that even this proportion has escaped the flames. It would be interesting and useful to show on a map the recently burnt areas and those occupied by the second growth of different ages, each to include, say, those of every twenty years, and I think I have the necessary data to enable me to do a large part of this work with sufficient accuracy for practical purposes.

The modern Indians, even in these northern wildernesses, have become every year more and more dependent upon the white man, and they rely less upon the resources of the country for the means of making a constant living than did their forefathers, who appear to have been a more thoughtful and independent class of men. In the course of the extensive travels in the North above referred to, I have taken every opportunity as a Government officer to warn the natives to be more careful about allowing the woods to catch fire, and on revisiting certain districts, after a few years, I have found that my advice had been followed, and that forest fires had not been nearly so common as previously. One of the reasons for the growing frequency of forest fires is that the Indians travel more than they did formerly (and thus make more fires than when they were accustomed to stay longer in one place), along with the fact that they are less careful to extinguish them when they are not on or near their own hunting grounds. It gives them some trouble to put out a fire completely when they leave a camp, or where they may have stopped to cook a meal or gum their canoe by the way, and an Indian will seldom do anything except by necessity. In the course of my own journeys I often hire Indians to travel with me only for limited distances, sending them back when I find fresh ones to take their places. In this way a considerable number generally come under my influence in the course of a season. I always take great pains to make these men extinguish all our fires, and instruct them to keep up the practice, even in their own interest, after they leave me. The fires for cooking breakfast or dinner are only allowed to be kindled on bare rocks or on the beach, where there is little danger of their spreading, and those which we are obliged to make in the woods for our camp at night are always carefully dug out and drenched with water and the moss all around saturated before leaving. On account of the fire burrowing under the dry moss, it is seldom completely extinguished by merely throwing a few kettlefuls of water upon the brands. It requires to be dug out with sharp sticks, otherwise it will go on smoldering until a favorable opportunity allows it to burst into flame. As an additional precaution, I camp as often as possible upon small islands. In spite of all this care my party was once the unwitting cause of burning the woods on an island in the Nelson river. We had made our mid-day fire on a wide surface of sloping rock near the edge of the river and a considerable distance from the woods, and afterwards threw the brands into the water, as usual, and dashed some kettleful all over the place where the fire had been. But on our return, two or three weeks afterwards, we found that a spark must have fallen unnoticed into the dry moss and loam of a long narrow crack in the rock, which ran up to the edge of the woods, for we saw that the fire had followed this, like a train of gunpowder, and that on reaching the bush the wind had fanned it into flame. Rotten coniferous wood, when thoroughly dry and broken up, or pulverized, is particularly tenacious of fire, and it appears to seize eagerly on every spark that falls amongst it. It requires to be thoroughly blended with water before one can be certain that even some floating piece may not be alight in its centre.

Let us try to picture the conditions under which the great forest fires of Northern Canada take place. A whole country-side, of practically unlimited extent, is densely clothed with conifers, mostly spruces, balsam, tamarac, and Banksian pine. The trees are crowded so closely together that their branches touch or intermingle. The ground is deeply covered with dry moss. After prolonged hot weather and drouth the moisture becomes thoroughly dried out of the gummy leaves and branches, leaving the resin and turpentine ready for ignition. All the conditions are now present, and only await a spark of fire to give rise to one of the wildest scenes of destruction of which the world is capable. When the fire has once started, the pitchy trees burn rapidly: the flames rush through their tops and high above them with a roaring noise. Should the atmosphere be calm, the ascending heat soon causes the air to flow in, and after a time the wind acquires great velocity. An irresistible front of flame is soon developed, and it sweeps forward, devouring the forest before it like the dry grass in a running prairie fire, which this resembles, but on a gigantic scale. The irregular line of fire has a height of a hundred feet or more above the trees, or two hundred from the ground. Great sheets of flame appear to disconnect themselves from the fiery torrent and leap upward and explode, or dart forward, bridging over open spaces, such as lakes and rivers, and starting the fire afresh in advance of the main column, as if impatient of the slower progress which it is making. These immense shooting flames are probably due to the large quantities of inflammable gas evolved from the heated tree tops just in advance of actual combustion, and they help to account for the almost incredible speed of some of the larger forest fires, one of which was known to run about 130 miles in twelve hours, or upwards of ten miles an hour.

The wild animals appear to understand the significance of the roaring noise and the clouds of smoke in the sky in advance of these conflagrations and far ahead of the actual flames: the terrified deer, bears, wolves, and lynxes may be seen fleeing for their lives, followed by multitudes of the small fur-bearing animals, hares, &c., all of which are, however, soon overtaken and destroyed. Should the larger creatures be so fortun-

nate as to reach a lake or river in time, they may escape along with the beavers, muskrats, and otters, which seldom stray far from the water; but it not infrequently happens that bears and other animals, which have been roasted in these fires, are found and eaten by the Indians after they have passed over. The birds flutter up in confusion in advance of the wall of fire and appear to drop back into the flames. Human beings sometimes perish in these catastrophes, as happened to a number during the surveys for the Canadian Pacific Railway.

Should the smoke be carried by the wind in such a direction that one of these fires may be witnessed at night, the scene is one of the grandest which it is possible to imagine, and may be compared to the burning of a great city with a line of fire extending far out of sight. The feeling of distant solitude, combined with the view of such wide-spread destruction, gives the mind an impression of weird grandeur which can scarcely be conceived under any other circumstances.

In the more southern districts of Canada, where the timber consists largely of white and red pine, the character of the forest fires is somewhat different, being less rapid and not so complete in its effects. This is owing to the more open nature of both the timber and its foliage, the trees growing further apart and having almost naked trunks, and also to the circumstance that they are generally mixed with deciduous trees, all of which prevent the fire from acquiring such a strong body as in the coniferous thickets of the north. Still, fires are sometimes moderately extensive in the pine woods and destroy large quantities of these more valuable timber trees.

I do not propose to go into the question of how far, if at all, these great forest fires affect the rain-fall in our northern districts. Only accurate observations on the ground and extending over a long period of years could determine the matter satisfactorily. It is worthy of remark, however, that around most of the lakes ancient water-marks may be seen on the rocks high above any which have been reached for a great length of time, as proved by the growths of lichens. But it is possible that this may be due to permanent lowerings of these lakes by the gradual deepening of their outlets.

Let us now proceed to make some kind of calculation of the quantity of available fuel which is destroyed in a given area by a northern forest fire, apart from any further value which the coniferous trees of the north may have as timber for local purposes or for export. An acre of the old or original forest, of the character already described, or of the full-size second growth, would produce on an average twenty to thirty cords of good wood in addition to the branches and roots, as compared with fifty or sixty cords which might be obtained from an acre of heavy hard-wood bush. Taking into account both the older and the younger second growths of these regions the average might not produce more than at the rate of ten to fifteen cords per acre. Still, at the low estimate of fifteen cords for the average of the old timber and second growths, each square mile (640 acres) would yield 9,600 cords. If we now take a comparatively small portion of our vast northern coniferous forest, say an area the size of Great Britain, or 89,000 square miles, it may safely be said to bear 854,400,000 cords of good wood. The population of all Canada from the Atlantic to the Pacific is about five millions, the greater number of whom live in the milder parts; but supposing that an average of twenty cords of this fuel, per family, would be required for a year's consumption and that there are one million families, we have here sufficient fuel for all domestic purposes for a period of upwards of forty-two years, or till a new crop, affording an equal quantity, could be grown; so that if properly protected from fire, this limited area is capable of supplying a population of five millions of people with abundance of fuel to warm their houses and cook their food for all time. A much smaller area must necessarily have served all the wants of the more numerous British people themselves, both for fuel and other purposes, before they discovered the use of mineral coal, as a large proportion of the island was either cultivated, or under forests which were never cut down for fuel; and again, open or rocky country, like much of Scotland and Wales, must also be taken into account. Our northern forest-belt is more than thirty times as extensive as Great Britain, and it is probable that, at the rate of destruction which has been going on in recent years, more than a thirtieth part of it, or an area equal to England, Scotland, and Wales, is burnt off annually; or, in other words, we are losing every year as much fuel as would supply the domestic wants of the whole Dominion for nearly half a century.

Can anything be done to prevent or lessen this terrible waste? One would naturally suppose that this question would be looked upon as of the first importance by the people of Canada, as a similar one is regarded in Scandinavia, more especially when we consider that almost the whole of this enormous area is destitute of coal or lignite, and that its greatest industry, if it is ever to be populated at all, will be the mining and reduction of metals, in both of which operations much wood is required, besides what may be wanted for domestic and other purposes. Yet our people never appear to give the matter a thought, and indeed the subject is seldom even mentioned. Laws against the wilful or negligent starting of fires in the woods have been placed on the statute-

books of the organized provinces, in which some kinds of timber have a present commercial value, but these ordinances have practically little effect, as no adequate provision is made for their enforcement. Besides the laws themselves, we require the necessary machinery to carry them out. What is wanted is a proper number of paid officers or forest guardians, each with a staff of men, whose duty it would be to look after the timber districts, whether belonging to the Crown or leased as limits to the lumbermen. These officers and their men should have power to arrest or lay information against persons suspected or known to have wilfully or by their negligence set fire to the woods. As matters now stand, many guilty persons are allowed to escape through the reluctance or fear which disinterested or private individuals may have in regard to informing against them. It is not to be expected that a private citizen will voluntarily assume the odium, trouble, expense, and loss of time necessary to do what is as much the duty of every other member of the community for the general good of the country. The work would not be so unpleasant in the hands of a paid government officer clothed with ample authority. Lumbermen are often blackmailed by bad characters whom they have been obliged to dismiss from their service and whose movements they cannot always watch, but who they know would be very apt to set fire to their limits for the sake of revenge. The forest guardians should keep an eye not only on such persons, but even on careless Indians, explorers, and bush-travellers generally. These officers, and also the head men of all the lumbering establishments in the woods, should be empowered to call out every man within reach to fight forest fires when they break out. Our fish and game laws are also, to a great extent, a dead letter from a similar want of executive force, and it would probably be found advantageous also to utilize the services of the forest guardians in assisting to carry them into effect.

In Scandinavia, where the preservation of the forests is regarded as of vital importance, the laws against setting them on fire are very severe. Any person who may have caused a forest fire, whether by "accident" or otherwise (no accidents being recognized in connection with this matter), is held liable for all he is worth toward making good the damage, and he is imprisoned besides. Under these circumstances forest fires are very rare. The climate of Scandinavia in summer is more damp than ours, and lightning is less frequent, so that strict forestry regulations are more urgently required with us. Laws of much less severity than those referred to, if they could be uniformly enforced in Canada, would soon have an appreciable effect in preventing the wholesale destruction of valuable standing timber which is going on to such an alarming extent in this country.

Volume VII, Proceedings A.T.A., consists of the Proceedings of the Atlanta, Ga., 1888, Meeting and the Philadelphia Meeting 1889. Of the latter, only the address of Hon. Carl Schurz is printed in pamphlet form, the remaining part of those proceedings being published in Forest Leaves (Phila.), in the following numbers:

Dec. 1889--pp. 112-118, 120-121.

Jan. 1890--pp. 130-132, 135-138.

Mch. 1890--pp. 149-156.

Apr. 1890--pp. 7-14, 17-19.

THE NEED OF A RATIONAL FOREST POLICY IN THE
UNITED STATES.

ADDRESS

DELIVERED BEFORE THE

AMERICAN FORESTRY ASSOCIATION

AND THE

PENNSYLVANIA FORESTRY ASSOCIATION,

AT

HORTICULTURAL HALL, PHILADELPHIA,

OCTOBER 15TH, 1889,

BY

HON. CARL SCHURZ.



Vol. VII

PHILADELPHIA :

CORRESPONDING SECRETARY'S OFFICE, AMERICAN FORESTRY ASSOCIATION.

218 SOUTH FOURTH STREET.

AMERICAN FORESTRY ASSOCIATION.

(FORMERLY AMERICAN FORESTRY CONGRESS.)

FOUNDED 1882.

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ESTIMATED FORESTRY INTERESTS OF THE UNITED STATES.

Acres covered with wood growth, or 26 per cent. of total land area,	450,000,000
Acres burned over in Census year, 1880,	10,274,089
Corresponding loss estimated at	\$25,462,250
Value of forests burned in 1889,	\$85,000,000
Acres cut over annually,	25,000,000
Wood consumed annually :	
Timber and lumber, cubic feet,	4,800,000,000
Railroads, " "	500,000,000
Mining Timber, " "	150,000,000
Fences, " "	500,000,000
Fuel, " "	18,000,000,000
Export, " "	150,000,000
Total cubic feet,	24,000,000,000
Value of wood consumed annually,	\$1,000,000,000
Wood growing annually on the present forest area of the United States, cubic feet,	12,000,000,000
Saw-mill capacity of the United States, ft. B. M.	60,000,000,000
Timber lands belonging to the U. S. Government, acres,	70,000,000
Value of timber reported stolen from public lands during seven years,	\$36,719,935
Amount recovered during same period,	\$478,073
Amount expended for protective service,	\$475,000
Forest administration of United States Government,	None.
Forestry Division of Department of Agriculture, Bureau of Information ; appropriation,	\$10,000

ADDRESS.

Members of the Forestry Associations, and Ladies and Gentlemen.

I cannot refrain from expressing my thanks to the Committee of Arrangements for doing me the honor of inviting me to take part in this meeting. It is true, not until yesterday could I see my way clear to come, and I have not been able to prepare an elaborate address, such as seems to have been expected of me. All I can offer is a few off-hand remarks, more in the nature of a conversational talk than of a formal speech. I pray you therefore to divest yourselves of all solemnity of expectation.

Let me in the first place assure you of my most earnest sympathy in your efforts. I am heart and soul with you: nor is this to me a new subject. I know, the advocates of the cause to which you are devoted, are looked upon by many as a set of amiable sentimentalists, who have fallen in love with the greenness of the woods and break out in hysteric wails when a tree is cut down. I assure you I have been led to take an earnest interest in this subject by considerations of an entirely unsentimental, practical nature, and this, no doubt, is the case with most of you. The more study and thought I have given the matter, the firmer has become my conviction that *the destruction of the forests of this country will be the murder of its future prosperity and progress*. This is no mere figure of speech, no rhetorical exaggeration. It is simply the teaching of the world's history, which no fair-minded man can study without reaching the same conclusion.

I am aware that there are people who turn with a sneer from the expression of any fear that our country may become sterile; who profess to be highly amused, when those countries in Asia are pointed out to them, which once were called lands "flowing with milk and honey;" whose mountains were cov-

ered with forests, whose hills with the vine and the fig-tree, and whose plains with waving grainfields, which nourished teeming and prosperous populations, building up mighty cities and great monuments of the civilization of their times ; now bare soil, barren and desolate wastes and deserts, roamed over by wild beasts and robbers, the ancient prosperity changed into misery, famine and decay, the people relapsed into barbarism : or when we point to Spain, once covered with a luxuriant vegetation, one of the most fertile countries of antiquity, the granary of the Roman Empire, at the close of the middle ages still the realm in whose dominions the sun never set ; now in a great measure stripped bare, the old fertility gone, the people in large districts struggling with poverty and want.

Infatuated persons among us turn up their noses at these and similar lessons and superciliously exclaim : What do we in this great and free country of ours care about abroad ? Let me say to you that the laws of nature are the same everywhere. Whoever violates them anywhere, must always pay the penalty. No country ever so great and rich, no nation ever so powerful, inventive, and enterprising can violate them with impunity. We most grievously delude ourselves if we think that we can form an exception to the rule. And we have made already a most dangerous beginning, and more than a beginning, in the work of desolation. The destruction of our forests is so fearfully rapid that, if we go on at the same rate, men whose hair is already gray, will see the day when in the United States from Maine to California and from the Mexican Gulf to Puget Sound there will be no forest left worthy of the name.

Who is guilty of that destruction ? It is not merely the lumberman cutting timber on his own land for legitimate use in the pursuit of business gain ; it is the lumberman who in doing so, destroys and wastes as much more without benefit to anybody. It is not merely the settler or the miner taking logs for his cabin, and fence rails and fire-wood, or timber for building a shaft, but it is the settler and the miner laying waste acres or stripping a mountain slope to get a few sticks. It is all these, serving indeed legitimate wants, but doing it with a wastefulness criminally reckless.

But it is not only these. It is the timber thief—making haste to strip the public domain of what he can lay his hands on, lest another timber thief get ahead of him—and in doing this, destroying sometimes far more than he steals. It is the tourist, the hunter, the mining prospector who, lighting his camp-fire in the woods to boil water for his coffee or to fry his bacon, and leaving that fire unextinguished when he proceeds, sets the woods in flames and delivers countless square miles of forest to destruction.

It is all these, but it is something more, and, let us confess it, something worse. It is a public opinion looking with indifference on this wanton, barbarous, disgraceful vandalism. It is a spendthrift people recklessly wasting its heritage. It is a government careless of the future and unmindful of a pressing duty.

I have had some personal experience of this. The gentleman who introduced me did me the honor of mentioning the attention I devoted to this subject years ago as Secretary of the Interior. When I entered upon that important office, having the public lands in charge, I considered it my first duty to look around me and to study the problems I had to deal with. Doing so I observed all the wanton waste and devastation I have described. I observed the notion, that the public forests were everybody's property, to be taken and used or wasted as anybody pleased, everywhere in full operation. I observed enterprising timber thieves not merely stealing trees, but stealing whole forests. I observed hundreds of saw mills in full blast, devoted exclusively to the sawing up of timber stolen from the public lands.

I observed a most lively export trade going on from Gulf ports as well as Pacific ports, with fleets of vessels employed in carrying timber stolen from the public lands to be sold in foreign countries, immense tracts being devastated that some robbers might fill their pockets.

I thought that this sort of stealing was wrong, in this country no less than elsewhere. Moreover, it was against the spirit and letter of the law. I, therefore, deemed it my duty to arrest that audacious and destructive robbery. Not that I had

intended to prevent the settler and the miner from taking from the public lands what they needed for their cabins, their fields, or their mining shafts; but I deemed it my duty to stop at least the commercial depredations upon the property of the people. And to that end I used my best endeavors and the means at my disposal, scanty as they were.

What was the result? No sooner did my attempts in that direction become known, than I was pelted with telegraphic despatches from the regions most concerned, indignantly inquiring what it meant that an officer of the Government dared to interfere with the legitimate business of the country! Members of Congress came down upon me, some with wrath in their eyes, others pleading in a milder way, but all solemnly protesting against my disturbing their constituents in this peculiar pursuit of happiness. I persevered in the performance of my plain duty. But when I set forth my doings in my annual report and asked Congress for rational forestry legislation, you should have witnessed the sneers at the outlandish notions of this "foreigner" in the Interior Department; notions that, as was said, might do for a picayunish German principality, but were altogether contemptible when applied to this great and free country of ours. By the way, some of the gentlemen who sneered so greatly, might learn some lessons from those picayunish German principalities, which would do them much good. I recently re-visited my native land and saw again some of the forests I had known in my younger days,—forests which in the meantime had yielded to their owners or to the government large revenues from the timber cut, but were now nevertheless as stately as they had been before, because the cutting had been done upon rational principles and the forests had been steadily improved by scientific cultivation. I passed over a large tract I had known as a barren heath, the heath of Luneburg, which formerly, as the saying was, sustained only the "Heidschnucken," a species of sheep as little esteemed for their wool as their mutton—the same heath now covered with a dense growth of fine forest. Instead of sneering, our supercilious scoffers would do better for themselves as well as for the country, if they devoted their time a little more to studying

and learning the valuable lessons with which the experience of other countries abounds.

What the result of my appeals was at the time I am speaking of, you know. We succeeded in limiting somewhat the extent of the depredations upon the public forests, and in bringing some of the guilty parties to justice. A few hundred thousand dollars were recovered for timber stolen, but the recommendations of rational forestry legislation went for nothing. Some laws were indeed passed, but they appeared rather to favor the taking of timber from the public lands than to stop it. Still, I persevered, making appeal after appeal, in public and in private, but I found myself standing almost solitary and alone. Deaf was Congress, and deaf the people seemed to be. Only a few still voices rose up here and there in the press in favor of the policy I pursued.

Thank Heaven, the people appear to be deaf no longer. It is in a great measure owing to your wise and faithful efforts that the people begin to listen, and that in several states practical steps have already been taken in the right direction.

As the chairman very truthfully and pointedly said, the forestry question divides itself into two branches, preservation and restoration. The first appears at present by far the most important. There are forests in this as in all countries, the preservation of which is absolutely necessary, because they perform an office which nothing else can perform. Whatever differences of opinion there may be as to the influence of the forest on climate in other respects, it is universally conceded that the forest is in an important sense the regulator of the flow of waters. It is a well known story. Springs and water-courses which flow with steadiness while the forest stands, are, when the forest has disappeared, dried up or at least largely reduced in volume one part of the year, to be transformed into raging and destructive torrents during another part. In the shape in which it would be a blessing, the water fails. It appears in the shape of a curse. Of paramount necessity therefore, is the preservation of the forest which covers the headwaters of the great rivers and their affluents, especially in the mountain regions with steep and rocky slopes, where the forest

once destroyed can never be restored. Once strip the precipitous mountain side, and the rain and melting snow will soon wash down the scanty soil ; the naked rock will appear on the surface, and the growth of a protecting vegetation will be impossible forever. The mountain torrents swelled by rain and melted snow that no longer find any earth to soak, will then periodically rush down with undiminished volume, inundating the valleys below, and in many cases cover them with gravel and loose rock swept down from the steep slopes, gradually rendering them unfit for agriculture and sometimes even for the habitation of men. I have had occasion to observe results such in more than one instance.

The preservation of mountain forests of this kind is therefore of supreme importance, and where they are still in public possession, they should be set apart as permanent reservations, either by the several states or by the general government—or when they are in private lands, they should, if possible, be regained by the government and reserved.

Steps of that kind have fortunately been taken with regard to the Adirondacks in New York, but those steps have unfortunately been too long delayed, for, as is reported, the destruction of the Adirondack forests have already gone far enough to cause a diminution of the reliable water supply in the Mohawk and Hudson rivers of from thirty to fifty per cent.; nor have they proved effective and comprehensive enough, for that destruction is still going on at a distressing rate. As to Pennsylvania, a service of incalculable value would be rendered to her people if the state regained control over the forest lands in the heart of her mountain regions, for the hand of the destroyer is mercilessly active. A few years ago I happened, on a railroad inspection, to penetrate into the mountains of north-western Pennsylvania and beheld a spectacle of direful import. A corporation, a large majority of whose stock was said to be held in Massachusetts, had acquired an area of forest land of, if I remember rightly, 200,000 acres. They not only cut down every tree, but they destroyed even the underbrush, not leaving a stick or a shoot standing. They made the mountain sides as bare as the palm of my hand. And when I asked the superin-

tending officer of the company what was meant by this radical destruction, which would not even leave a chance for the forest to grow up on these slopes in the future, the answer was, that the company did not wish the forest to grow up there again; it was its object first to sell the logs and then to clear the land for the purpose of selling it as pasture. It is not hazardous to predict that when those mountain sides have been washed by rain for a few seasons, many, if not most of them, will no longer furnish verdure enough to nourish a goat. Such things are going on in the mountains of Pennsylvania, and unless in some way they be stopped, it will soon be too late.

There is a mountain region in the far north-west which demands the earliest possible attention of our national authorities. It is the great area of mountain forest covering the headwaters of the Missouri and Columbia. The government cannot too soon take effective steps to protect these forests, which are among the most important in the United States, against destruction, by making them a permanent reservation and having them carefully guarded.

When speaking of the preservation of forests, we do not, as has already been eloquently set forth by our chairman, mean that they should be kept untouched and unused as the miser keeps his hoard, but that they should be made useful in a way preventing their destruction and even improving their value, as forests are made useful in other civilized countries.

In my first annual report as Secretary of the Interior, twelve years ago, I made some recommendations leading to that end, the main points being in substantial accord with the project of a bill drafted by your committee. Permit me to read them:

"All timber lands still belonging to the United States should be withdrawn from the operation of the pre-emption and homestead laws, as well as the location of the various kinds of scrip. Timber lands fit for agricultural purposes should be sold, if sold at all, only for cash, and so graded in price as to make the purchaser pay for the value of the timber on the land. This will be apt to make the settler careful and provident in the disposition he makes of the timber.

"A sufficient number of government agents should be provided to protect the timber on public lands from depredation, and to institute to this end the necessary proceedings against depredators, by seizures and by criminal as well as civil actions. Such agents should also be authorized and instructed, under the direction of the Department of the Interior or the Department of Agriculture, to sell for the United States, in order to satisfy the current local demand, timber from the public lands under proper regulations, and in doing so especially to see to it that no large areas be entirely stripped of their timber, so as not to prevent the natural renewal of the forest. This would enable the people of the mining states and of the territories to obtain the timber they need in a legal way, at the same time avoiding the dangerous consequences above pointed out.

"The extensive as well as wanton destruction of the timber upon the public lands by the wilful or negligent and careless setting of fires calls for earnest attention. While in several, if not all of the states, such acts are made highly penal offenses by statute, no law of the United States provides specifically for their punishment when committed upon the public lands, nor for a recovery of damages thereby sustained. I would therefore recommend the passage of a law prescribing a severe penalty for the wilful, negligent, or careless setting of fires on the public lands of the United States, principally valuable for the timber thereon, and also for the recovery of all damages thereby sustained.

"While such measures might be provided for by law without necessary delay, I would also suggest that the President be authorized to appoint a commission, composed of qualified persons, to study the laws and practices adopted in other countries for the preservation and cultivation of forests, and to report to Congress a plan for the same object applicable to our circumstances."

The provisions your project of a forestry bill has added to this plan are certainly appropriate, especially the proposed Forestry Commission to superintend the execution of this policy.

It has been objected that the introduction of such a system

would involve an addition to the number of public officers and cost money. Certainly it would, as the army costs money, as the police costs money, as the building of sewers costs money, as public schools cost money, and as so many other things necessary to the safety and well being of the people cost money. But I do not hesitate to say that the money spent for the army, the police, and public schools is not spent to greater public advantage than the money spent for the introduction of a rational forestry system would be. However, a part of the public service already existing might well be used for the purpose of guarding at least the forests belonging to the public domain of the United States. It may well be assumed that although trifling Indian disturbances may still occur here and there, the danger of Indian wars on a large scale is now behind us. If a wise, just, and humane Indian policy be followed, we may be sure that it is altogether over. Not a few of our outlying military posts may then be abandoned, and a part of our army will become disposable for other purposes. Why should not two or three battalions be organized as forest guards or forest rangers, the men, perhaps, also to receive some useful instruction to fit them for their new duties? Surely, no soldier could in time of peace and there being no prospect of war, be more usefully employed.

Of the influence of forests on climate and of the necessity of planting or re-planting them where they fall below the proportion which the area of forest should bear to the aggregate area of the country, men more competent than I am have spoken and will speak to you. We are all agreed also on the necessity of spreading information on this important subject. No respectable university or agricultural college should be without a department in which forestry as a science is taught; and most of us will no doubt see the day when the importance of that science will be recognized by every thinking American. Let us hope that this appreciation will come in time. I regret, we cannot forcibly enough impress upon the American people the necessity of speedy measures looking to the preservation of our mountain forests which, when once destroyed, cannot be renewed. Unless this be done in time, our children will curse the

almost criminal improvidence of their ancestors, but if it is done in time, those who are instrumental in doing it will deserve and will have the blessings of future generations.

To bring up the public opinion of this country to the point where it will command such measures, a vigorous and unceasing agitation is required. I do not underestimate the difficulties it will have to overcome. It is the shortsighted greed which acts upon the rule to grab all that can be got at the moment, and "let the devil take the hindmost," not stopping to consider that he who does so may be among the hindmost himself, and that in this case his children certainly will be. It is that spirit of levity, so prevalent among our people, which teaches to eat and drink and be merry to-day, unmindful of the reckoning that will come to-morrow. It is the cowardice of the small politician who, instead of studying the best interests of the people, trembles lest doing his full duty may cost him a vote, and who is not seldom apt to fear the resentment of the thieves more than that of honest men.

Such influences you will have to overcome, but you will meet them in the future as bravely as you have met them in the past, and may a speedy and complete triumph crown your patriotic efforts.

PROCEEDINGS

OF THE

American Forestry Association



AT THE

Summer Meeting, held in Quebec, September 2—5, 1890,

AND AT THE

Ninth Annual Meeting, held in Washington, December 30, 1890.

WASHINGTON, D. C.

Secretary's Office, 1429 New York Ave.

1891.

NOTE.—*The American Forestry Association, whether inviting persons to read papers from its platform, or publishing those papers afterwards in connection with its proceedings, is not to be understood as endorsing the views expressed, or adopting them as its own. It offers its platform for the purpose of promoting a free and full discussion of all questions of importance connected with the subject of Forestry.*

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- Anders, Dr. J. M., 1637 N. Broad St., Phila.
 Beale, Edw. F., Jr., 231 S. Front St., Phila.
 Beaver, Hon. James A., Bellefonte.
 Binney, Chas. C., 218 S. 4th St., Phila.
 Coates, Geo. M., 1817 De Lancey Pl., Phila.
 Cox, Mrs. Brinton, 1711 Locust St., Phila.

PENNSYLVANIA—Continued.

- Coxe, Mrs. E. B., Drifton.
 Edge, Thos. J., Harrisburg.
 Elwyn, Rev. A. L., 1422 Walnut St., Phila.
 Fisher, Dr. Henry M., 317 S. 12th St., Phila.
 Hazeltine, Frank, 1825 Walnut St., Phila.
 Heston, Mrs. Geo. T., Newtown.
 James, H. F., Franklin.
 Jayne, H. LaBarre, 505 Chestnut St., Phila.
 Jones, Horatio G., 135 S. Fifth St., Phila.
 †Lea, Henry C., 2000 Walnut St., Phila.
 Lundy, Rev. J. P., 245 S. 18th St., Phila.
 Lundy, Mrs. J. P., 245 S. 18th St., Phila.
 *Peabody, Chas. B., 1415 Spruce St., Phila.
 Praetorius, Geo. O., Pottsville.
 Sellers, William, 1600 Hamilton St., Phila.
 Walker, William, 45 S. 3rd St., Allegheny.
 Welsh, Herbert, 1305 Arch St., Phila.
 Wolfe, Dr. Samuel, 1624 Diamond St., Phila.

RHODE ISLAND.

- Davis, L. D., 207 Thames St., Newport.
 Emmons, Arthur B., Newport.
 Mason, Miss Ida, Rhode Island Ave., Newport.

SOUTH CAROLINA.

- Atkinson, Prof. Geo. F., Columbia.
 Green, Prof. H. A., Chester.
 Lawton, Hon. John, Lawtonville.
 McKie, Thos. J., Wood Lawn.

SOUTH DAKOTA.

- Keffler, Prof. Chas. A., Brookings.

TENNESSEE.

- Goulding, B. L., Chattanooga.
 Wright, Col. Thos. T., Nashville.

TEXAS.

- Jones, W. Goodrich, Temple.

VERMONT.

- Battell, Jos., Middlebury.
 Cutting, Hiram A., Lunenburg.

WISCONSIN.

- Putnam, H. C., Eau Claire.

DISTRICT OF COLUMBIA.

*Abbe, Prof. Cleveland, Washington,
 †Ayres, H. B., Dept. of Agriculture.
 Bowers, Edw. A., 1429 N. Y. Ave.
 Dickson, Dr. S. H., 1728 I St., N. W.
 Egleston, Dr. N. H., Dept. of Agriculture.
 Fernow, Bernhard E., Dept. of Agriculture.
 Fernow, Mrs. B. E., Washington.
 Riley, Prof. C. V., 1714 13th St., Washington.
 Robbins, Mrs. M. A., Dept. of Agriculture.
 *Warder, Prof. Robert B., Howard University.
 Willets, Hon. Edwin, Dept. of Agriculture.

ONTARIO.

Allan, Hon. G. W., Toronto.
 Blue, Hon. A., Dept. of Agriculture, Toronto.
 Bryce, Dr. Peter H., Toronto.
 Craig, John, Dominion Exp. Farm, Ottawa.
 *Denton, John M., London.
 Heneker, R. W., Sherbrooke.
 Morgan, J. H., Amherstburg.

ONTARIO—Continued.

Saunders, Prof. Wm., Ottawa.
 Thane, E. S., Ottawa.
 White, A., Dept. of Crown Lands, Toronto.

QUEBEC.

Barnard, E. A., Dept. of Agriculture, Quebec.
 Barth, Ulric, Quebec.
 Beaubien, Hon. Lewis, Montreal.
 Campbell, Archibald, Quebec.
 Department of Crown Lands, Felix Campeau, Accountant, Quebec.
 *Drummond, A. F., Montreal.
 Greenough, W. P., Pontneuf.
 Joly, Hon. H. G., Pointe Platon.
 LeMoine, J. M., Quebec.
 *Little, Wm., Montreal.
 Moore, Geo., Montreal.
 Moore, H. D., Moore's Sta.
 Perrault, Hon. J. X., Montreal.
 Price, H. M., Quebec.
 Robitaille, Hon. L. A., Quebec, Box 742.
 Ross, Hon. David, Quebec.
 Ross, W. J., Quebec.
 Shanley, Walter, Montreal.
 Turner, Richard, Quebec.

CONSTITUTION

OF THE

AMERICAN FORESTRY ASSOCIATION.

ARTICLE 1. This Association shall be known as the American Forestry Association.

ARTICLE 2. The objects of this Association shall be the discussion of subjects relating to tree-planting, the conservation, management, and renewal of forests, and the climatic and other influences that affect their welfare: the collection of forest statistics: and the advancement of educational, legislative, or other measures tending to the promotion of these objects. It shall especially endeavor to centralize the work done and diffuse the knowledge gained.

ARTICLE 3. Any person may become a member of this Association, subject to approval by the Executive Committee, by the payment of the annual dues. The annual dues shall be two dollars. Any member may become, by the payment of fifty dollars at one time, a life member, and shall not be liable thereafter to annual dues. Any person contributing one hundred dollars to the Permanent Fund of the Association shall be a Patron.

ARTICLE 4. The officers of this Association, to be elected at the annual meeting, shall be a president, one vice-president for each State, Territory, and Province represented in the Association, a treasurer, a recording secretary, a corresponding secretary, and an executive committee consisting of these officers and six other members. Three of this committee shall constitute a quorum. This committee shall choose its own chairman.

ARTICLE 5. The President shall preside at all meetings of the Association in General Session, and in his absence a Vice-President shall preside.

ARTICLE 6. The Recording Secretary shall keep a record of the proceedings of the Association, and shall be custodian of all documents, books, and collections ordered to be preserved.

ARTICLE 7. The Corresponding Secretary shall conduct the correspondence of the Association.

ARTICLE 8. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Executive Committee.

ARTICLE 9. The Association at any regular meeting, or its Executive Com-

mittee in the intervals between its meetings, may appoint such local or special committees as may be deemed proper, and shall define their duties.

ARTICLE 10. The annual meeting of the Association shall be in the months of August, September or October, or at such times and places as shall be determined by a vote in General Session or by the Executive Committee. Special meetings may be called by the Executive Committee.

ARTICLE 11. At each annual meeting there shall be an election of officers for the ensuing year, and they shall remain in office until others are chosen. In cases of vacancies occurring in the intervals between the annual meetings, they may be filled by the Executive Committee until others are selected. In case of absence of an officer at a regular meeting his place may be deemed vacant.

ARTICLE 12. The officers of States, Territories, Provinces, or Local Forestry Associations, or their delegates, or the delegates of any Government, may participate in the proceedings of the Association as Honorary Members.

ARTICLE 13. This Constitution may be amended by a two-thirds vote of the members present at any annual meeting.

BY-LAWS.

1. Papers or abstracts of papers to be read must be sent two weeks before any meeting, for classification, to the Corresponding Secretary.

2. The following classification of subjects is adopted for the reading of papers :

Section A. Forest Planting, Forest Management, Forestry Proper, Preservation of Forests.

Section B. Forest Economy, Technology and Statistics.

Section C. Applied Science and Climatology, General Topics.

3. Contributors who are present shall have the preference in reading their papers.

4. Any member shall be entitled to the privilege of using any books or documents, not of record, at the discretion of the Recording Secretary.

Summer Meeting,

Held in Quebec, Sept. 2d to 3th, 1890.

TUESDAY, SEPTEMBER 2d.

The Association met in the Hall of the Legislative Council at 8 P. M., many ladies and gentlemen of Quebec being present. Hon H. G. Joly, of Quebec, First Vice-President, called the meeting to order and read a letter from Gov. James A. Beaver, of Pennsylvania, the President, regretting his unavoidable absence and expressing his earnest wishes for the success of the meeting. The Lieutenant Governor of Quebec, Mr. Angers, then welcomed the Association on the part of the Provincial Government, referring to the importance of the lumber interests of Canada, the necessity of proper forest administration, and the system now pursued in Quebec and the other provinces, which may be summed as follows :

In Canada licenses are issued for cutting timber on the Government land. A very large proportion of all the timber land of the country is still in the hands of the Government, hence the Government can control the cutting of the timber, and has adopted certain rules with regard to the cut, which it is the duty of the Government Inspectors to see enforced. Thus, pines less than twelve inches and spruce trees less than nine inches at the butt must by law remain free from the axe. By this system the young trees are spared, and at the end of twenty or thirty years a new crop of commercially valuable timber is ready to be cut.

One can get some idea of the importance of the timber product of Canada from the statement that between 1867 and 1889 430,000-000 feet of lumber, board measure, and 69,600,000 cubic feet of timber, had been cut in the Province of Quebec alone. The Crown timber dues amounted to \$9,800,000, and last year, from that source alone, the Province received nearly a million dollars.

This drain upon the forests, he said, could only be borne if they were wisely and economically managed, and the American Forestry Association was looked to for advice and suggestions in regard to such management.

Mr. J. M. Le Moine, President of the Reception Committee.

followed with an address of welcome on behalf of the citizens. These addresses were responded to by Mr. Bernhard E. Fernow, Chief of the Forestry Division of the United States Department of Agriculture. He spoke of the example of forest preservation set by the early American settlers, especially those of Canada, an example which their descendants had ceased to follow, of the rise, growth, and work of the Association, and of the help and encouragement received from its Canadian members.

Brief addresses were made of Dr. Peter H. Bryce, of Toronto, Mr. William Little of Montreal, and Mr. Joly, after which the meeting adjourned.

WEDNESDAY, SEPTEMBER 3d.

Morning Session, 10 A. M., Mr. Joly in the Chair.

A resolution to defer the election of officers to a winter meeting, to be held in Washington, D. C., was adopted.

The members and delegates in attendance were reported as follows :

Colorado. Col. E. T. Ensign, Forest Commissioner.

Florida. Mrs. W. J. Keyser, Milton.

Maine. Hon. George F. Talbot, Portland.

Massachusetts. J. D. W. French, Boston ; N. T. Kidder, Milton ; John M. Woods, Somerville.

New Hampshire. J. B. Harrison, of the Forest Commission.

New York. Gen. James Grant Wilson, New York.

Ohio. Prof. W. R. Lazenby, Agric. Experiment Sta., Columbus.

Pennsylvania. Mrs. Brinton Coxé, Philadelphia ; Thos. J. Edge, Secy. State Board of Agriculture ; Dr. Henry M. Fisher, Philadelphia ; Mrs. George F. Heston, Newtown.

District of Columbia. B. E. Fernow, Chief of Forestry Division ; Mrs. Fernow.

Ontario. Hon. Archibald Blue, Dr. Peter H. Bryce, Toronto ; John Craig, Ottawa ; Hon. A. White, Toronto ; Aubrey White, Deputy Commissioner of Crown Lands.

Quebec. Edward A. Barnard, Secy. Board of Agriculture, Ulric Barthe, Quebec ; Hon. Louis Beaubien, Montreal ; Archibald Campbell, Quebec ; W. P. Greenough, Pontneuf ; Hon. H. G. Joly de Lotbinière, Pointe Platon ; J. M. Le Moine, Quebec ; William Little, George Moore, Montreal ; H. O. Moore, Moore's Station ; J. X. Perrault, Montreal ; H. M. Price, Hon. L. A.

Robitaille, Hon. D. A. Ross, Hon. E. E. Taché, Deputy Commissioner of Crown Lands, Richard Turner, Prest. of Chamber of Commerce, Quebec.

Reports of the conditions of forestry interests in the several States and provinces were then made as follows :

Col. E. T. Ensign made a report for Colorado.

Hon. George F. Talbot, of Maine, spoke of the wasteful method of utilizing forest products that he had observed in his own State. Immense numbers of young pine and spruce trees which, if left to themselves, would in the course of a few years furnish valuable lumber, were habitually sacrificed for wood pulp, scantling, matches, etc., while remnants from the saw-mill would answer the same purpose. "We, in the State of Maine," he said, "are obliged to go in search of our masts to the State of Washington ; to Tennessee or Michigan for boards of a quality good enough for the fine inside work of our hotels and private houses. Our water courses, since the destruction of our forests, have become capricious torrents, inundating the whole surrounding country after each heavy rain, while the beds of these streams dry up a few hours later."

Mr. Talbot alluded to the scheme which had been proposed : that townships should secure the title to tracts of waste lands, these lands to be protected, as far as possible, from fire and pasturage, and administered by the town for the benefit of the tax-payers in such town or township. This scheme he thought was particularly applicable to Maine, where the assessments on timber land were too high and the risks too great for owners not provided with large capital to keep land in timber.

Mr. John M. Woods presented a brief statement of the condition of the forests and woodlands of Massachusetts.

General James Grant Wilson, of New York, spoke of the terrible devastation in the Adirondack forests, and of the efforts that were now being made to secure State control of those forests. He alluded to the beneficial results of Arbor Day, and the private attempts at reforesting waste districts, mentioning those of Hon. William Walter Phelps, who had for some years been engaged in this work, planting on an average 40,000 trees each year.

Prof. W. R. Lazenby reported the condition of affairs in Ohio.

Mr. Aubrey White, Deputy Commissioner of Crown Lands for the Province of Ontario, gave a very interesting account of the present forest administration of that Province. The Government of Ontario, like that of Quebec, leases the right to cut timber on

certain limits, but restrictions are also imposed in Ontario as to the size of the timber to be cut. Mr. White gave figures from the Crown Lands' office, showing how large had been the increase of late years of the license fees for timber limits.

He also presented some very interesting details on the Ontario system of forest protection against fire by the joint action of the holders of limits and the Government, each contributing an equal share of the expense.

The reports of the Executive and Legislation Committees were then read by the Acting Secretary, Dr. H. M. Fisher.

REPORT OF THE EXECUTIVE COMMITTEE.

To the Members of the American Forestry Association :

The Executive Committee presents the following report on the condition of the Association, the work done since the last annual meeting, and the condition and prospects of the movement for forest reform.

At the annual meeting in October last an important change was made in the composition of this committee, in order, as it was hoped, not only to render it more effective for continuous work by securing a quorum of members within reach of each other, but also to keep it in touch with the forestry movement all over the country by officially connecting with the committee one member, a vice-president, in every state, territory and province. In fulfilment of this latter feature of the plan, your committee, as instructed, has elected vice-presidents in twenty-five states, one territory, the District of Columbia, and the Province of Ontario, Quebec being already represented. Vice-presidents for the four other states where we have members will be chosen as soon as proper selection can be made. The plan was a good one, save in one most important particular, and this defect has seriously crippled the work of your committee. No five members (the number fixed as a quorum) reside near enough to each other to hold any meetings without decided inconvenience, and hence all conference has had to be by correspondence, and the treasurer and corresponding secretary have had to act on their own responsibility much more than they had any desire to do. If hereafter the committee be composed chiefly of members resident in one place, who can meet regularly, they will not only accomplish far more work, but also stimulate the

activity of the vice-presidents, and avail themselves of the help rendered by the latter. The wisdom of having these vice-presidents is already seen in the accession of new members, many of whom have been brought in through their influence.

Owing to the need of the change above suggested, it was thought best to defer the incorporation decided upon at the last meeting.

Though thus defectively organized, the committee has not been inactive. The treasurer's report last year showed the immediate need of a larger income. To secure this, and also to diffuse and increase the association's influence, an increase in the membership was indispensable. As this question of membership is of great importance to the continued life of the association, a few facts and figures in regard to it are worth considering. Originally planned as a congress of delegates from local forestry associations, this body only sought to secure members enough in each state to form the nucleus of that local society which they were expected to found, and no special effort was made to gain a large membership for the parent association. Very few local societies were formed however, and none in any way tributary to the parent body, so it became clear that our own members could alone give us strength and influence, that we must either increase or decrease, and that our members having decreased very considerably since a few years ago, the tide must be turned or we should soon cease to exist at all. Accordingly, with the copies of Mr. Schurz's address sent in pamphlet form to all members in November last, a circular was also sent stating the needs of increased membership, and asking each member to appeal to his own friends and acquaintances to join the association, experience having shown that this could be made the most effective means of winning new members. While a few, especially in Massachusetts and New York, exerted themselves to fill our ranks, the idea of each man working for the association by constituting himself a recruiting sergeant seems to have been too novel, and the call met with no general response. An appeal for members and contributions, explaining the objects of the Association, was also printed and widely distributed, partly by individual members, but chiefly from the secretary's office.

In response to the appeal and the personal solicitation of members, over sixty new members have been added since the October meeting, exclusive of several who joined during that meeting. This brings our present total to 196, which would have been greater but that twenty-three names have been struck off the rolls

on account of death, resignation, and continuous non-payment of dues. The number of new members may seem small, but as hitherto there have been practically no accessions except at the annual meetings, it is a clear gain. It is interesting to note that among the number are some old members who had resigned, but who now desire to join the ranks again.

At the beginning of the year there were seventy members, nearly half the total membership at that time, who had been admitted to life membership some years before on payment of ten dollars. Necessary current expenses had in the course of time exhausted the sum so raised, so that the whole expense of the association was being borne by the eighty-five other annual members, although many of them had paid in dues more than the life membership fee. A statement of the facts, suggesting a voluntary relinquishment of their rights, was sent to all life members, and it is gratifying to state that while no disapproval of the scheme has been received from any one, fifteen of the members have resumed payment of annual dues, while three others have become life members on payment of fifty dollars as provided in the amendment adopted last year. Of these new life members there are now eleven in all, and the fund of \$550 secured thereby remains intact to form the nucleus of a permanent invested fund.

Our members are now found in twenty-nine states, one territory, the federal district, and two provinces of Canada, as follows :

Alabama, 2 ; Arizona Ty., 1 ; California, 6 ; Colorado, 5 ; Connecticut, 4 ; Florida, 2 ; Georgia, 7 ; Illinois, 4 ; Indiana, 2 ; Iowa, 1 ; Kansas, 2 ; Kentucky, 3 ; Maine, 5 ; Maryland, 1 ; Massachusetts, 40 ; Michigan, 1 ; Minnesota, 5 ; Missouri, 2 ; Nebraska, 4 ; New Hampshire, 2 ; New Jersey, 4 ; New York, 27 ; Ohio, 14 ; Pennsylvania, 22 ; Rhode Island, 2 ; South Carolina, 4 ; Tennessee, 2 ; Texas, 1 ; Vermont, 2 ; Wisconsin, 1 ; District of Columbia, 7 ; Ontario, 6 ; Quebec, 6 ; In short, while our membership is small, it is believed that there are few if any nominal members, and if only each individual member will bring in a few others, *women as well as men*, our growth may be very rapid.

The experience of other associations clearly proves that in a body that meets as rarely as ours, it is absolutely necessary to keep up the interest of the members by the distribution of publications, and at the Atlanta meeting in 1888, it was decided to subscribe to the Pennsylvania Forestry Association's paper, "Forest Leaves," for all our members, so that it could be sent to them regularly. Your

committee have continued this subscription (which is made at a very favorable rate) and believe it the best policy to do so, as the paper not only brings before all our members very valuable and interesting information in regard to forestry, but also helps to keep them in touch with the forestry movement all over the country. Besides this it supplies a ready means of reaching an appreciative class of readers for all matter which this Association or its members may wish to have published.

In view of this arrangement it was thought better not to print a pamphlet report of the last meeting (as had sometimes formerly been done) but to have the minutes published by themselves in *Forest Leaves*, and also, in successive numbers, the papers read or presented at that meeting. A great saving of expense has been effected thereby, and the proceedings of the meeting have been much more widely made known than could readily have been done otherwise.

The report of the Committee on Legislation will show what has been done in the effort to secure a proper legal basis for national forest preservation, but in addition thereto the general status of the forestry movement all over the country needs a few words.

It is true, that there is as yet little that is new to be said as to the actual treatment and condition of the forests themselves. The old story of wasteful cutting, of the laying bare of mountain slopes where trees are absolutely essential to hold the soil together, and of the ravages of fire, a story with which this Association is but too familiar, must be told again this year. The terrible fires of 1889 will probably long remain without a parallel, but it is only a question of degree. Without adequate protection from fire, the loss must be serious enough every year. As to cutting, too, the absolute divorce, which has existed in this country ever since its settlement, between the mutually essential occupations of timber-cutting and timber-raising, continues practically unchanged.

On the other hand, signs of an approaching change and a fundamental improvement in the treatment of our forests are clearer now than ever. Your committee has been in correspondence with citizens and the press all over the country, and it is undeniable that a very general awakening to the necessity of forest preservation is taking place, gradually indeed, but surely. The increased numbers of this and other associations, the re-organization of the New York Association, the formation of that in Texas, and the successful meetings held in various places are proofs of this, nor are others

wanting. The press, formerly silent as to our forestry needs or unfavorable to any reform, is now throwing more and more of its influence in aid of the movement for forest preservation ; and in this connection too much cannot be said of the energy and intelligence with which the condition of the Adirondacks has been laid before the public. The fact that the approaching scarcity of timber has led many owners of forest lands to hold them for higher prices should also not be disregarded. The temporary forest preservation thereby effected is both a good thing in itself and a necessary first step to proper forest management ; and while the latter is probably not yet even in contemplation, its advantages must eventually appeal to men who have already learned to look beyond the present moment.

The loudest cries for forest reform come from the widely separated States of New York and California. The effects of deforestation in the Adirondacks touch the manifold interests of a large number of people so closely and so plainly that the mere reservation of some forest lands under the charge of an unpaid commission cannot satisfy the demand for the preservation of the Adirondack woods. The existence of this demand was made evident at the last session of the New York Legislature, and if the end in view is steadily pursued it can hardly fail of eventual attainment. The New York Forestry Association has its work clearly before it, and should receive aid and encouragement from every patriotic citizen of the State.

In California the prosperity of many fruitful valleys is dependent on a water supply of whose regularity the existence of forests on the mountains is the only guarantee. Axe and flame have made serious inroads on those forests, and they are also becoming more and more a pasture ground for sheep and cattle. The people are awake to the dangers which threaten them, but unfortunately their appeal for protection has to be made at Washington, and not at San Francisco, and amid the mass of legislation constantly before Congress it is no easy task to make the claims of one section heard. That a region which human industry has turned into a garden should relapse into a wilderness through the impossibility of securing proper legislation would be a sore reproach to our boasted American civilization.

In conclusion, your committee can frankly say that while present conditions are anything but satisfactory, and the prospect in many places far from hopeful, yet, through the agency of this and other

associations, the need of proper forest management is being gradually brought home to the minds of the American people. Upon the speed with which the people are won over to the cause of forest reform depends the nearness of the day when that great menace to our national welfare, the waste and destruction of our forests, shall be a thing of the past.

Respectfully submitted,
For the Executive Committee,
CHAS. C. BINNEY, *Secretary*.

REPORT OF THE COMMITTEE ON LEGISLATION.

To the Members of the American Forestry Association :—

Your Committee, elected by the Executive Committee chosen at the Philadelphia Meeting, respectfully report as follows :—

The members of this committee being widely scattered over the country, their conferences have been chiefly by correspondence. On November 14th, 1889, a meeting was held at the office of the Assistant Secretary of Agriculture, at Washington, D. C., to confer with a committee of the American Association for the Advancement of Science, and other persons interested in National forest preservation. Your committee was represented by Messrs. Ensign, Higley and Binney. There was a full discussion as to the actual condition of the National forests, the best practical means of preserving them, and the legislation that could reasonably be expected. The same day the above members of your committee, together with Assistant Secretary Willets, and Messrs. Fernow, Bowers and Eggleston, of your Association, waited upon the Secretary of the Interior to express their views as to the reservation and protection of the public forest lands. Major Powell and Colonel Hinton of the United States Geological Survey were present.

In accordance with the understanding arrived at at these conferences, an admirable memorial was prepared by the American Association for the Advancement of Science, and transmitted by the President of the United States to Congress on January 20th; and your committee prepared a Memorial to Congress and the House of Representatives Bill, No. 7026.—“For the reservation and protection of forest lands on the public domain, and to establish a commission to inquire into the condition of the said lands, and to report a plan for their permanent management.” The Bill was intro-

duced in the House on February 17th, by Mr. Dunnell, of Minnesota, who afterwards secured the appointment by the Public Lands Committee (to whom the Bill had been referred) of a sub-committee on forestry legislation. The Chairman of this sub-committee being from Pennsylvania, the Committee on Law of the Pennsylvania Forestry Association coöperated by asking the influence of the latter Association and the press in support of the Bill. Mr. Fernow and others of your Association resident in Washington, and also Mr. Binney of this Committee, appeared before the sub-committee and found its members disposed to favor a measure more similar to your Association's Bill of two years ago. Messrs. Fernow and Bowers met the sub-committee and its members repeatedly during the session. Since, however, the Public Lands Committee has had much important work before it, and since a thorough revision of the land laws in all its parts is contemplated, including the present method of disposal of timber lands, action upon this particular legislation has been deferred until the more comprehensive plans of land legislation could be digested. But the assurance is given that, early in the next session, such a Bill for a permanent forest administration as will meet the views of the Committee on Public Lands, will be prepared by the sub-committee and laid before the House.

WILLIAM ALVORD, JOHN E. HOBBS, CHARLES C. BINNEY,
 ABBOT KINNEY, HERBERT WELSH, J. STERLING MORTON,
 EDGAR T. ENSIGN, WARREN HIGLEY, *Committee.*

After an active discussion of the various questions raised by the reports of the delegates and of the Committees, Mr. J. D. W. French moved that a Special Committee be appointed "to consider the Report of the Executive Committee, and the best means of obtaining some practical results from the work of this Association." This motion was carried, and the Chair appointed Messrs. French, Fernow, J. X. Perrault, J. B. Harrison, P. H. Vilmorin, E. E. Taché, Wm. Little, and Aubrey White as the Special Committee. The Congress then adjourned until 2 P. M.

Afternoon Session, 2 P. M.—Mr. Joly read a paper by Mrs. S. W. Dodds, M. D., of St. Louis, Mo., on "What Causes the Cyclones."

Mr. B. E. Fernow read a paper on "Forests as a National Resource;" While he was reading, the old Huron chief, Thomas Siouhi, entered the hall with his son, clad in full Indian costume.

When the paper was ended, the chief said, "We are the children of the forest, and are come to welcome the friends of the forest. Since I was sixteen years old, the forest has been my country. I have lived in it and I hope to die in it. We are not numerous; we are gradually disappearing like the great trees of our woods. Protect us and our forests, and you will have the prayers of the Hurons and the gratitude of their hearts."

Mr. Taché read an official report on "The Administration of the Public Forests of the Province of Quebec."

Mr. Joly exhibited at the close of the session a fine piece of black walnut grown from a tree planted by him at his place at Pointe Platon fifteen years ago. He said that in making such plantations of trees those of the highest commercial value should be selected.

Evening Session, 8 P. M.—Colonel E. T. Ensign, Forest Commissioner for Colorado, read a paper on "The Rocky Mountain Forests."

Dr. N. H. Egleston's paper on "The Preservation of Small Forests," was then read by title.

Professor Lazenby gave an interesting account of the method adopted in Ohio of celebrating Arbor Day, and said that Ohio was one of the first of the States to introduce into her public schools the annual observance of Arbor Day, and that the practice of tree planting on that day had perhaps been more generally and heartily carried out in Ohio than in any other State.

Mr. A. Blue stated that Arbor Day had been established by law in the Province of Ontario, and that the Government had appropriated \$50,000 for Arbor Day and agricultural improvements.

After some remarks by Mr. Fernow and others as to the importance of endeavoring to secure an extension of the system of Arbor Day tree planting, Mr. H. L. de Vilmorin, of Paris, France, read by invitation a paper on the "Forest Administration in France."

Mr. Vilmorin is one of the partners in the seed house of Vilmorin & Andrieux of Paris, of world-wide reputation, and his description in brief of the system of forest management in France was listened to with deep interest.

Mr. Auguste Dupuis, of St. Roch des Aulnaies, read a paper on "Experiments with Southern Trees in the Far North of Quebec." Mr. Dupuis brought with him a number of samples of trees that he had planted.

Messrs Fernow, Tallot, Lazenby and Bryce spoke of the work upon which Mr. Dupuis had been engaged in terms of the warmest approbation.

Mr. Joly followed with a paper on "Tree Planting on the Prairies."

The meeting then adjourned till Thursday morning.

THURSDAY, SEPTEMBER 4th.

Morning Session, 10 A. M.—When the session opened His Excellency the Governor General, Lord Stanley of Preston, welcomed the American Forestry Association to Canada, and expressed his deep interest in the work of the Association.

Professor Lazenby, of the Ohio Agricultural Experiment Station, requested the members to excuse the absence of the paper he had promised on "Timber Planting in Ohio," which had unfortunately been stolen from him on his journey.

He, however, gave a brief resumé, from memory, of the main points in this paper, and stated which varieties of trees had been proved, by actual experiment at the Experiment Station in Ohio, to be most useful for plantations. Of these, the ash stood at the head of the list. He said that wagon builders in Columbus were complaining of the dearth of proper hard wood for wagons, particularly of hickory, and advised the planting of this and other trees, the demand for which was steadily increasing, while the supply steadily diminished.

Mr. J. X. Perrault, of Montreal, then read an abstract, in English, of a paper he had prepared on the "Adoption of a Regular System for the Cutting of Timber on Our Public Lands," "La Mise en Coupe réglée de nos Forêts."

Hon. G. Duhamel, Commissioner of Crown Lands for the Province of Quebec, then addressed the meeting on forestry.

Afternoon Session, 2 P. M.—At the opening of the afternoon session Sir Ambrose Shea, Governor of the Bahama Islands, visited the meeting. Mr. Joly having spoken of the pleasure it gave him to welcome so distinguished a guest to the Councils of the Association, Sir Ambrose thanked his friend, Mr. Joly, for the kind allusion to him, and speaking of recent events, expressed the hope that reciprocity between the United States and Canada would soon be established. Later in the afternoon the Congress received a visit from the Prime Minister of the Province of Quebec, the

Hon. Mr. Mercier, who was accompanied by Mr. Daniel Dougherty, of Philadelphia. Mr. Mercier and Mr. Dougherty both addressed the meeting. Mr. Dougherty spoke in favor of abolishing all trade barriers between the United States and Canada.

Mr. Fernow read a paper upon "The Effect of Forest Mismanagement on Orchards."

An address was then delivered by Mr. J. B. Harrison, of New Hampshire.

The Hon. J. K. Ward then read a paper on the "Duties of the Government and of Lumbermen in the Management of the Public Forests."

A discussion then ensued on Mr. Ward's scheme of fires and insurance.

Mr. William Little read a paper entitled: "The Protest of the Pine."

Mr. John Craig followed with a paper on "Forestry at the Dominion Experimental Farms."

Mr. William Saunders, Director of the Central Farm, in a paper on "Forestry on the Western Plains of Canada," further described the practical work done by the Dominion in the way of tree planting on the barren prairies.

Evening Session, 8 P. M.—Mr. Joly presented specimens taken from badly pruned trees, and spoke of the importance of pruning branches away close to the stem and making clean vertical cuts. He also distributed to the members of the Association some copies of Professor Sargent's edition of Count des Cars' work on "Tree Pruning." (These were the gift of the Massachusetts Society for the Promotion of Agriculture.)

The chairman then read a note from the Governor of Texas inviting the American Forestry Association to hold their next meeting in the State of Texas; referred to the Executive Committee. The report of the special committee which had been appointed "To consider the report of the Executive Committee, and the best means of securing some practical result from the work of the Association," was then read by the chairman of the special committee, Mr. J. X. Perrault.

The following is the *Report*:—

"His Honor the Lieutenant Governor of the Province of Quebec having suggested that this Association should propose such measures as they think advisable in order to secure the preservation and permanence of the forestry domains of the Province, the

American Forestry Association recommends : That the working of the timber limits should be so regulated that while the largest amount of timber may be cut which the virgin forest affords, this be not done without proper provision for a recuperation of the timber crop, or protection against fire, cattle, and other agencies injurious to the continuance of forest growth.

" The Association recognizes the fact that it is not in its power to devise the methods by which such recuperative reproduction may be attained, applicable to all the different conditions, political, administrative and forestal, which may prevail in the Province, but it would respectfully state some facts and principles which must be understood in order to inaugurate a forest policy superior to that now in existence.

" It would appear that without a special investigation of existing conditions, with a view of applying forestry principles in their management, such changes, with the present system, could not be attained.

" It is contrary to the public interest of any country, that lands which are covered with forest and have little or no agricultural value, should be opened for settlement or alienated by the State, but such lands should be kept in forest and carefully preserved from destruction by the ravage of fire, or by settlement. The methods by which the management and reservation may be effected are various and must be adapted to local conditions ; but, whatever methods are employed, it is necessary to have an efficient and well-trained corps of officers conversant with the principles of forestry.

" The recuperation of a national forest is not effected by a simple utilization of the ripe timber and superior kinds of trees, and by leaving the remaining growth to itself. It can be economically and satisfactorily attained only by a wisely directed cutting which keeps in view the re-seeding of the original growth or of more valuable kinds.

" The protection of forests against fire and cattle is naturally of the first importance, and cannot be effected by legislation alone without devising the proper machinery to carry out the law. In regard to fire legislation, preventive measures are of more use than curative. Hence, all methods of cutting timber, such as the hewing of logs in the forest, by which inflammable material is accumulated in the forest, such should be discouraged.

" It must be recognized that the present methods of lumbering

take no consideration of the future of the resource upon which the lumber business is based, and any regulations that are adopted should promote such a change of methods as will secure continued forest growth upon the forest reserves. These regulations, along with legislation for the protection of the forest against fire and theft, will comprise perhaps all the forest administration that is at present practicable.

"It will be advisable to encourage young men to study forestry at one of the forestry schools of Europe, so that gradually a corps of forestry officers may grow up, capable of applying the more refined principles of forest management, when the time for such has arrived."

The report also submitted the following resolutions :—

I. Regarding the State Board of Forestry of California.

WHEREAS, The State of California has had, for some years past, a State Board of Forestry, charged with the forestry interests of that State in general, and with the protection of the timber lands of said State against fire and depredation, especially disseminating, at the same time useful information in their reports, and

WHEREAS, It has been suggested that political considerations may lead to a discontinuance of said board, or to such a reduction of the appropriations provided for such board, as must necessarily hamper its work and curtail its usefulness—

Resolved, that the Council and members of the American Forestry Association, in meeting assembled at Quebec, view with alarm the possible occurrence of such a contingency, rooting out, as it were, the first germ of a rational forest policy, which the State of California had wisely planted, and cannot without detriment to its agricultural interests afford to discontinue.

While, then, there is no personal connection between the members of the Forestry Board and the members of this Association, which is concerned in this matter only from its general interest in proper forest preservation, and while this Association does not desire to pass judgment in regard to the efficiency or inefficiency of the work of said Board, we earnestly hope and pray that any discontinuance or limitation in the functions of such Board, if contemplated, will find the vigorous opposition of every fair-minded legislator, and that efforts for an extension and increase of efficiency in this first and foremost American forest administration will alone meet with success.

Resolved, that a copy of these expressions of interest in the for-

est policy of the State of California, be forwarded to the Governor and Legislature of the State of California:

II. *Regarding the Big Trees of Tulare County, California.*

Resolved, that the American Forestry Association, being advised that the last grove of big trees in Tulare county is in danger, under the regular working of the land laws, of being turned over to private parties, respectfully submit to the Honorable Secretary of the Interior, that the value of these Sequoias, for their grandeur and their beauty, is much greater than it can be for lumber, and that their preservation as a monument of natural history is of national concern.

Resolved, that the American Forestry Association therefore urge the Honorable Secretary to use such power as is at his command to withhold from entry such grove or groves as are still in the possession of the general government, until proper legislation for the permanent reservation of the same can be enacted by Congress.

III. *Regarding Model Farms.*

Resolved, that in the attempts made to encourage agriculture by offering prizes for model farms, the importance of the woodlands necessary on every farm (deserving to be considered a model farm) for the supply of fuel and lumber, as well as for shelter and ornament, ought not to be overlooked, and that the state of the woodland should receive, in these competitions, all the attention that it deserves.

IV. *Resolved*, that the thanks of the American Forestry Association are hereby presented to His Honor the Lieutenant Governor and other officials of the Province of Quebec, and also to the city authorities, for the courtesies extended to its members, and for their promotion of the objects of the association, and

V. *Resolved*, that the thanks of the American Forestry Association be presented to the Reception Committee and to the citizens of Quebec, for the hospitalities so courteously granted.

The report of the Committee and the resolutions therein contained, were unanimously adopted.

The Hon. J. K. Ward then read a paper entitled "Reminiscences of the Lumber Trade of Canada." He said that about fifty-two million acres of timber land were held by the Dominion Government under the license system, and estimated that the supply of lumber would last thirty-seven years at the present rate of cut.

Dr. Peter H. Bryce then presented a paper on "Forests in their Relation to Health."

It was moved and seconded that a vote of thanks be given to Dr. Bryce for his interesting paper; carried.

Mr. George Moore read a paper on "Shade and Ornamental Trees in Cities."

Papers by Mr. H. B. Ayres, of Minnesota, entitled "Minnesota Woodsmen," and by Mr. J. C. Chapais, on "Forest Preservation and Restoration," were read by title.

On motion of Mr. J. D. W. French, of Massachusetts, the Report of the Executive Committee was adopted, and the question of the publication of a report of the meeting referred to that committee.

A letter from Mr. W. A. Stiles, Editor of *Garden and Forest*, asking the Forestry Association to interfere for the protection of the big trees in Tulare County, California, was read. (See recommendation embodied in Special Committee's Report.)

A letter from Colonel Thomas T. Wright, of Nashville, to the President, suggesting the desirability of enlisting the support of the women of the country in the cause of Forestry, and forming an Association of Daughters of Forestry, and also of holding a meeting in Chicago during the season when the World's Fair was in progress, was read, but no action was taken thereon.

It was moved that a vote of thanks be tendered to the Hon. H. G. Joly for his unselfish devotion to the interests of the Association during all its sessions in Quebec, and for his unwearied kindness and courtesy.

Professor W. R. Lazenby, Mr. Fernow, and General James Grant Wilson all warmly seconded the motion. Carried.

The meeting then adjourned to meet again at the call of the Executive Committee.

Numerous courtesies were extended to the members of the American Forestry Association, during their stay in Quebec. On Tuesday afternoon, September 2d, Mr. J. M. Le Moine took a number of the delegates to the Laval University, and showed them the interesting natural history collections and the picture gallery. On Friday, September 6th, the members of the American Forestry Association and the members of the Alpine Club of France were taken on board the steamer "Druid" (placed at their disposal by the Dominion Government), and proceeded down the St. Lawrence to the Island of Orleans, paying a visit to the Church of St. Anne, to which pilgrimages are made, and were hospitably entertained on board by the Corporation of the City of Quebec.

Before parting, the members met once more to plant on the Parliament grounds two hickory trees from General Andrew Jackson's place, which had been sent from Tennessee by Col. Thos. T. Wright, with the request that one of the trees should be planted in honor of Lord Dufferin, late Governor-General of Canada. The other tree was planted in honor of Mrs. B. E. Fernow, in acknowledgment of the great services rendered by her husband to the cause of Forestry in America.

HENRY M. FISHER,
Acting Secretary.

ANNUAL MEETING,

HELD IN WASHINGTON, D. C., DECEMBER 30TH, 1890.

Morning Session. The Association met at the Department of Agriculture at 10 A. M.

Members were present from the following States :

Colorado. George H. Parsons ;

Connecticut. Dr. B. G. Northrop ;

Massachusetts. Thomas H. Appleton, J. D. W. French, N. T. Kidder ;

New York. Hon. Warren Higley, Hon. John A. King, Henry E. Pellew ;

Pennsylvania. Charles C. Binney, Rev. Alfred L. Elwyn, J. Rodman Paul, Gifford Pinchot ;

South Carolina. Prof. H. A. Green ;

Vermont. Hon. Joseph Battell ;

District of Columbia. H. B. Ayres, Edward A. Bowers, Dr. N. H. Egleston, B. E. Fernow, Hon. Edwin Willets, Assistant Secretary of Agriculture.

In the absence of Gov. Beaver, President, Dr. B. G. Northrop, one of the Vice-Presidents, presided.

Letters from Gov. Beaver, Hon. H. G. Joly, of Quebec, and Hon. G. W. Allan, of Toronto, regretting their inability to be present and expressing their great interest in the Association, were read.

The minutes of the summer meeting of the Association at Quebec were read in part, when, on motion, their further reading was dispensed with.

A committee on resolutions and the nomination of officers, consisting of Messrs. French, Parsons and Green, was appointed.

Most of those present not having attended the Quebec meeting,

the Report of the Executive Committee, presented at that meeting, was read by Mr Binney, and followed by a supplemental report.

SUPPLEMENTAL REPORT OF THE EXECUTIVE COMMITTEE.

To the Members of the American Forestry Association :

Since the report presented at the Quebec meeting was written, there have been thirty accessions to our numbers, which now reach 225, distributed through thirty states, one territory, the District of Columbia, and the provinces of Ontario and Quebec. The Association has sustained a serious loss in the death, on Sept. 30th, of Hon. Frederick R. Billings of New York and Woodstock, Vt., a valued member for several years past.

To look back nearly nine years, to the formation of this association at Cincinnati in April 1882, is not at first a cheering retrospect. The need of state and national legislation for forest protection and management was so clear that had any one then said that by the end of 1890 the state of New York alone would have even the beginning of a system of forest preservation, he would have been thought most despondent. Yet after all these years of work for forest reform we seem to stand just where we did in 1882, while the evils confronting us have intensified. In reality however, our position is very much stronger than it was then, for the people are gradually coming over to our side. In 1882, the American people as a whole cared little for forest preservation, either for economic reasons or as a matter of taste or sentiment. In 1890 it is undeniable that they are becoming concerned about the timber supply, as the changed tone of the lumber trade journals and the press in general clearly proves. It is felt that something more is needed for permanent lumbering than merely to cut down all the trees in sight, and that there must be some change from the old ways ; hence practical suggestions in the way of forestry are listened to and quoted, even if not as yet to any great extent followed. There is an increased sentiment in the matter, too, which is worth something, since every human being is swayed by sentiment and taste, far more, usually, than he is aware of. Despite the intensely practical nature of the American people, the love of flowers, purely a matter of taste and sentiment, has grown immensely in this country of late years. From flowers to trees is but a step, and a most natural one, which many people have taken. And as it is with floriculture, so it is with the more practical agri-

culture. How much a farmer cares for forest depends upon how intelligently he cares for his farm, and when once the whole American people, the practical as well as those of taste and sentiment, shall thoroughly and sincerely care for trees and forests, the forestry problem will be easy of solution, for then will be enlisted on the side of forestry that will which is sure to find a way.

A most valuable agency in this direction is "*Garden and Forest*," now completing its third year. Treating all matters of the garden most ably and thoroughly, it has also been steadily sowing the seeds of forestry in ground already fertilized by a lively interest in horticulture. It is clearly hastening the day when the interests of the garden and the farm will demand forest preservation and management as essential to their own prosperity.

The meeting at Quebec, Sept. 2nd to 5th, was, owing to the distance, attended by few of our members except those living in Canada, but those who went learned something of the sincere and practical efforts now made in Canada to prevent fire and induce reforestation. The interest and encouragement due to the atmosphere of *real forestry* demonstrated the wisdom of accepting the courteous invitation of the Quebec authorities.

In New England apparently the most important work of the year is that of the forest commission of New Hampshire which has been carefully investigating the forest lands of that state in order to ascertain the tracts which most need preservation and the most practical means of effecting this. Their report written by Mr. J. B. Harrison, in 1889 the corresponding secretary of this association, will soon appear and it is hoped that the legislature will take effectual steps to prevent that beautiful, health-giving forest region, the resort every summer of so many thousands from all parts of our country, from being turned into a bare, uninteresting waste.

In New York the commission appointed by authority of the last legislature has been investigating the Adirondack region with a view to securing a large state park, so as to preserve to some extent the forests of that attractive region and protect the sources of the Hudson. A bill providing for such reservation has been prepared after careful deliberation and will be presented to the legislature a few days hence. While a few railroad and lumbering interests may be arrayed against it, the necessity for its passage is so clear that in may be looked forward to with some confidence, provided the friends of the measure are active. No good law was ever yet passed without a struggle, and laws for forest reform will be no exception to the rule.

The organization of the Adirondack League Club, owning 93,000 acres of forest in Hamilton and Herkimer Counties in the southwestern part of the Adirondack region is important as constituting the first attempt at permanent forest management in this country on any large scale. The Club intends to treat its property not only as a summer resort and hunting ground, but as a tree farm, having the ripe timber cut and sold, but so as to make way for the new growth, and not to leave the ground either wholly bare or so littered over with waste stuff as almost to invite the fire to sweep through and destroy the life of the soil. It is no flattery to the projectors of this club to say that they will do more for forest reform than many associations such as ours. We represent precept, they example, and when once they make an ocular demonstration that there is money to be made by systematic forestry, the idea will take root and spread as it has never done before. And whatever be the success of the club it will be due in great part to the work of this association. Several of the stockholders are our own members, and what they will carry out in practice is simply that principle of forest management the idea of which this association has fostered and kept alive year after year in spite of delay and opposition until now the fruits of the work begin to be seen.

In national forest preservation, the year has not been as fruitful as was expected, but yet not wholly barren. The tariff bill, the pension bill, the silver bill, the elections bill have found many and eager advocates, but a practical forest law is less loudly and persistently demanded. Still, the extension of the Yosemite Park and the reservation of the *Sequoia* tract of 3500 acres in Tulare County, Cal., are something. The latter made the Quebec resolution in part unnecessary, but as the greater number of the *Sequoia* are outside the reservation, this important fact was communicated to the Secretary of the Interior along with the resolution.

The increased appropriation to the Forestry Division will enable it to continue the experiments and investigation as to forestry and rain-fall, and the collection and distribution of valuable seeds and plants.

The Quebec report of the committee on legislation may be supplemented by saying that no forestry bill has yet been reported to the House, and that this Congress is nearing its end. Should a determined effort be made, it might even now be possible to have a bill to provide the beginnings of a forestry system reported and passed, but this is not likely. In any case, though, the attempt to secure it must be renewed and kept up. This Association has two

immediate objects in view by means of which ultimately to secure forest preservation—education, leading the public mind to see the necessities of the situation; and legislation, establishing proper methods of dealing with the situation. It would be almost as fatal to abandon the fight on the second line as on the first.

To further build up the Association and continue its work, the constitution should be so changed as to allow of additional members of the executive committee, who should be elected from among the members resident in Washington, so that the committee could meet there regularly. There might also be a sub-committee on publication and membership, a quorum of which should reside in one place. By proper system and division of labor the work would not fall too heavily on any one, and the power of the Association be greatly increased.

Respectfully submitted,

For the Executive Committee,

CHARLES C. BINNEY, *Secretary*.

The Treasurer submitted the following report :

HENRY M. FISHER, TREASURER,

in account with

The American Forestry Association.

1889		DR.	
Oct. 15	Balance as per account rendered,	.	\$2 52
1890			
Dec. 30	To Receipts from Annual Dues,	.	383 00
"	" " " Life Membership Dues,	.	550 00
"	" Contributions,	.	122 00
"	" Interest on Deposits,	.	10 13
"	" Cash for the Sale of Pamphlets,	.	2 27
			<hr/>
			\$1070 02
		CR.	
1890	By Cash, Stationery and Postage,	.	\$124 67
Dec. 30	" Printing and Type-Writing	.	108 80
"	" Advertising,	.	18 60
"	" Traveling Expenses of Secretary,	.	12 45
"	" Expressage and Telegrams,	.	3 30
"	" Subscription to <i>Forest Leaves</i> ,	.	116 00
			<hr/>
Balance to credit of Current Expense Acc.			136 20
" " " Life Membership Fund,			550 00
			<hr/>
			\$1070 02

Messrs. Binney and Pinchot were on motion, appointed a committee to audit the Treasurer's account.

Dr. Northrop made a report from the Committee on Arbor Day in schools, which was very encouraging, showing that Arbor Day is now observed by schools in thirty-seven States.

By invitation Judge Higley reported upon the prospect of forest improvement in the State of New York, referring especially to the movement of the Adirondack Park Association, composed largely of business men, which proposes to have the State set aside 3,000,000 acres of Adirondack forest land and place them under proper forest administration. He also spoke of the work just begun by the Adirondack League Club, a company of private citizens who have purchased 100,000 acres of forest which they propose to maintain in its forest condition as a pleasure resort, while also so managing it as to make it a source of income from the sale of timber as it is ready for market.

At 12.30 o'clock a recess was taken until 2'clock.

At the opening of the afternoon session the Committee on Nominations and Resolutions reported a proposed amendment of the constitution so that Article 4 shall read as follows, viz :—

“The officers of this Association to be elected at the annual meeting shall be a President, one Vice-President for each State, territory, and province represented in the Association, a Treasurer, a Recording Secretary, a Corresponding Secretary, and an Executive Committee consisting of these officers and six other members. Three of this committee shall constitute a quorum. This committee shall choose its own chairman.”

The proposed amendment was adopted.

The Committee then reported a nomination of officers as follows :

President.—Wm. Alvord of California. *Vice-Presidents.*—Quebec, Hon. H. G. Joly ; Alabama, Dr. Chas. Mohr ; Arizona, D. M. Riordan ; Colorado, Geo. H. Parsons ; Connecticut, Dr. B. G. Northrop ; District of Columbia, Hon. Edwin Willets ; Georgia, Hon. C. R. Pringle ; Illinois, Geo. W. Minier ; Iowa, C. L. Watrous ; Kansas, Prof. E. A. Popenoe ; Maine, Jno. E. Hobbs ; Massachusetts, J. D. W. French ; Michigan, Prof. J. W. Beal ; Minnesota, Hon. C. C. Andrews ; Nebraska, R. W. Furnas ; New Hampshire, J. B. Harrison ; New Jersey, W. A. Stiles ; New York, Morris K. Jesup ; Ohio, Prof. W. R. Lazenby ; Ontario, Hon. G. W. Allan ; Pennsylvania, Herbert Welsh ; Rhode Island, L. D. Davis ; South Carolina ; Prof. H. A. Green ; South

Dakota, Prof. C. A. Keffer ; Tennessee, Col. T. T. Wright ; Texas, W. G. Jones ; Vermont, Dr. H. A. Cutting ; Wisconsin, H. C. Putnam. *Treasurer*.—Dr. H. M. Fisher, Philadelphia, Pa. *Recording Secretary*.—N. H. Egleston, Washington, D. C. *Corresponding Secretary*.—E. A. Bowers, Washington, D. C.

Additional members of Executive Committee :—B. E. Fernow, H. B. Ayres, E. T. Ensign, H. E. Pellew, Warren Higley, C. C. Binney.

The officers nominated were elected.

Informal reports as to the condition of forestal interests in several States were then made by Prof. Green of South Carolina, Mr. Appleton of Massachusetts, and Mr. Paul of Pennsylvania, which were followed by remarks from various members.

An invitation from Colorado to hold the next meeting of the Association in that State was received with thanks, and the decision as to its acceptance was referred to the Executive Committee.

The Association then took a recess until 7.45 o'clock P. M.

EVENING SESSION.

The Association met at the designated time, at the National Museum, in joint session with the American Economic Association.

Vice-President Willets called the Association to order and made a brief address.

The Committee on Nominations and Resolutions then reported the following resolutions :

1. *Resolved*, that immediate steps should be taken to reserve from sale and entry the forest lands now under national and State control, and to so preserve and administer them as to make them a source of permanent income to the governments, and especially that the sub-committee of the Public Lands Committee of the House of Representatives, appointed to consider forestry measures, be earnestly requested to report favorably a bill for the reservation, protection and management of the forests on the public lands of the United States.

2. *Resolved*, that permission should not be granted by the United States Government for the construction of any railroad in the Yellowstone National Park ; and that besides the passage of the necessary laws for the government of the said park, including the adequate punishment of offenders, the boundaries should be

extended so as to include adjacent forest lands, and should be more definitely marked.

3. *Resolved*, that this Association heartily approves of the request made by the Secretary of the Interior to the Secretary of War for two companies of cavalry to protect the Yosemite and Sequoia Parks, and respectfully urges the Secretary of War to grant this request.

The Association also urges upon Congress the desirability of farther extending such reservations as that lately made in Tulare County, and the need of extending the boundaries of Yosemite Valley Park.

4. *Resolved*, that the present efforts for forest administration and preservation in the Adirondack forests in New York and in the White Mountain regions of New Hampshire, both by the States, by Associations, and by individuals, deserve the earnest encouragement of the American Forestry Association, and that the members resident in those States be urged to co-operate with the Adirondack Park Association and the New Hampshire Forest Commission in securing the legislation needed.

5. *Resolved*, that this Association heartily advocates the establishment of forest parks by cities and towns, and especially commends the donation of such parks by private citizens to public uses, regarding them as important agents in promoting public interest in forest preservation as well as public health.

The Resolutions reported by the Committee were unanimously adopted.

Papers were then read by Edward A. Bowers, Esq., on "The Present Condition of Forests on the Public Lands," by Gifford Pinchot, Esq., on "Government Forestry Abroad," and by B. E. Fernow, Esq., on "The Feasibility of American Forest Administration."*

The Association then adjourned sine die.

N. H. EGGLESTON, *Recording Secretary*.

*These three papers will appear in a monograph on forestry, to be published by the American Economic Association. Copies can be obtained of the Secretary of the American Forestry Association.

Papers read at the Summer Meeting.*

THE FOREST AS A NATIONAL RESOURCE.

BERNHARD E. FERNOW, CHIEF OF THE FORESTRY DIVISION,
WASHINGTON, D. C.

In a paper which I read before this association last year, I classified the natural resources which serve the material progress of nations, with reference to the position which the nation as a whole ought to take towards them. I endeavored to show that the most prominent functions of government in regard to these resources are or ought to be providential in their nature ; that the state being in its very conception an institution to insure not only the present, but the future and continued welfare of the community, must have an interest in the permanence and proper utilization of natural resources, upon which this welfare rests.

To restate briefly the classification, we found two principal classes, namely :

(a) Resources which yield directly the necessities or conveniences of life and form objects of industrial activity ;

(b) Resources which serve indirectly the comforts of society, industry, and progress of civilization, and do not form objects of industrial activity.

It is the former class of resources mainly, which, if left to individual control, are most apt to deteriorate and in regard to which the interests of the individual and the community are most frequently at variance, and it is most difficult to find the proper balance between permissible freedom of individual disposal and necessary restriction by communal interest. In regard to the second class of resources, such as air, light, waterways, etc., the providential function of the state is much better understood and conceded, although even here the *laissez-faire* idiosyncrasists would give to individualism the widest latitude.

The resources which form objects of industrial activity were again divided, with reference to their continuity, into

1. Resources exhaustable and not restorable ;

*The Publication Committee regret that two or three of the papers read have never come into their hands.

2. Resources restorable, but liable to deterioration under increased activity ;

3. Resources restorable and apt to yield increased returns to increased activity.

To intelligently define the position which the state should take in the matter of protecting its resources against too rapid exhaustion or unnecessary deterioration, we must keep always in view the implied interest of the state in the future, and understand the nature of the resource, with reference to its future. In this paper it is proposed to define the proper position of the state towards its forest resources, and for this purpose to investigate the nature of these resources.

It is questionable whether the forest itself may be considered a resource. It is in reality a crop, a product of the soil ; and the soil with its fertility is the resource proper, which can be turned to this use or to any other. The forest primeval is nothing but a function of the fertility of the soil. As soon as the soil is not needed for other purposes more useful, this product of the soil may be valuable, and with means of transportation to a distant market, or as far as a home market exists, it may constitute a resource. As soon as with increasing population and hence demand for food-producing areas the occupation of the soil by wood-growth is a hindrance to its agricultural use; (and by this antagonism the value of the forest resource is apt to depreciate in proportion to the need for food areas) the wood product may become the opposite of valuable by necessitating its removal without a market for its disposal ; hence the burning log-pile of the pioneer settler, fed by the most valuable timbers. The need for cleared lands tends to diminish the occupation of the soil by wood-growth, until at last an equilibrium results, when the needs of food areas are satisfied and the requirements of wood material make a reservation of soil for forest growth desirable. When at last the stores of the virgin forest are exhausted and it becomes necessary to apply human ingenuity and management to the production of desirable quantities and qualities of wood material on a confined area, a new industry, forestry or forest management, arises, which exercises itself, like agriculture, upon the production of values from the soil.

So long, then, as the virgin forest is not placed under management, its stores represent the resource itself, and, being worked somewhat similarly to mines, it is an exhaustible resource, differing, however, from mines in its capacity of being reproducible. As

long as the activity in working the forest is simply directed towards the extraction of the valuable material which nature has stored up for centuries, every increase in this activity means corresponding depreciation and depletion of the resource. As soon as the forest becomes an object of scientific management, and artificial forest planting is resorted to, it is the soil and its fertility which is the actual resource, the tree-growth being a product of the same ; and then we may range it under the third class of resources, which yield increased returns to an intelligent increased activity, this activity being exercised not in the direction of utilization but of reproduction.

While the virgin forest is worked, as it is in the United States and Canada, simply taking out the material wanted without any regard to its continuance, it represents, as has been stated, almost like a mine, an exhaustible resource ; for although reproduction is possible, and in reality occurs, under these reckless methods of utilization, not only is the reproduction very partial, but where the better kinds of timber are culled the reproduction can only be of inferior kinds, and the quality of the resource is therefore reduced. In addition to the irrational method of utilization, which tends to deteriorate the resource, the disastrous fires which overrun the forest areas of the United States annually destroy the accumulated leaf-mould of centuries, thus reducing the fertility, killing the young growth, and especially on the hillsides and mountain slopes where, by the baring of the ground the beating rains are allowed to wash off the soil, making reforestation almost impossible, so that in the end the resource—whether the growth be considered as such or only the soil and its fertility, is exhausted.

But besides furnishing directly wood and incidentally other valuable products, which either as raw material or in manufactured form supply a large number of human wants, the forest at the same time by its functions in the circulation of air and water exercises an influence upon cultural, climatic, and sanitary conditions, which classes it to that extent with those resources, which, like air and water itself, are, though indirectly yet most indispensably connected with material and cultural progress, and are of the greatest interest to the nation ; so that in considering the position of the state towards forests and forestry, we will have to keep in view these two aspects of the forest—its material value and its cultural function.

The value of any material resource is measured, in the first place, by its comparative abundance. Other factors which enter

into the valuation are the demand for it, the ease with which it can be obtained and brought to centers of consumption, the possibility and ease of reproduction, and its necessity for our present civilization or more or less easy replacement by other materials may also influence the valuation.

I.—THE FOREST AS A PRODUCER OF MATERIAL.

As regards the natural reproduction and the consequent abundance of the virgin forest, it may be said that the whole earth is a potential forest. That is to say, with the exception of a comparatively small area—in elevation above timber-line, in north and southward distribution beyond eternal frost line, in continental distribution within rainless deserts and soilless rocks—tree growth would ultimately prevail on the entire land surface, provided the interference of animal or human life were checked.

This interference, however, has reduced the forest area in all parts of the world. It has, no doubt, been largely instrumental in creating the vast prairie regions and treeless plains which are found on every continent, and which, but for the continued interference, would gradually, at least within geologic ages, reclothe themselves with tree-growth, with few exceptions. If originally the land area represented an almost uninterrupted forest area, animal and human activity has changed the face of the earth considerably. This change has taken place partly to satisfy the needs of increasing masses of population for food areas, partly without such need, by reckless destruction; so that density of population cannot alone account for present distribution of forest areas, but the historic development of the people, their progress in civilization or relapse into comparative barbarism, and the natural conditions of the countries have had a bearing.

Thus, while Norway and Sweden, with scanty population, showed until recently, when an active export business of wood reduced their forest areas, a large proportion of woodland; in Spain and Greece, although the population diminished with the decline of culture, reforestation has not increased in proportion, and we find a small forest area together with scanty population. In Germany, economic development and early recognition of the value of the resource, and the necessity for its rational use and management, has preserved a proportionately large area. In the United States the proportion of forest area to population since its settlement by

European races has rapidly declined. Here almost one-half of the continent had by adverse climatic conditions, supplemented probably by the destructive agencies of beast and man of earlier civilization, been deprived of its tree-cover. To such an extent has human activity reduced forest areas that in those countries where it has been most active the proportions have dwindled down to even three per cent. of the land area.. Taking Europe altogether, not much over thirty per cent., or two and a half acres per capita, remains in forest, and in the United States the forest area represents probably not more than twenty-five per cent., or seven acres per capita of population.

The demand for forest products is perhaps nowhere greater than in the United States, probably not less than six to eight times as large as in Europe.

In Germany, with a population at least twelve times as dense as the United States—and hence the need of strict economy with all exhaustible resources—the annual consumption per capita may be set at about 45 cubic feet. The annual production of the well-managed forest areas of Germany is found to average 55 cubic feet of wood per acre; there should, therefore, be 0.8 acres per capita, which very nearly is the case, (0.79 acres), the small deficiency being made up by imports, the excess of imports over exports being about 60 million cubic feet. In the United States we use simply the accumulation of material through centuries in the virgin forest, the second growth furnishing but a small part, and of management for reproduction or increased yield there is as yet no sign.

In the virgin forest the product per acre varies to such an extent that it would be impossible to make even a reasonable guess as to available supplies; some of the pine forests of the South may cut no more than 200 or 300 cubic feet, while some areas on the Pacific Coast may yield 15 to 20,000 feet and more. If we apply the experience of Germany as to possible annual wood production per acre, we will find that our present forest area, if properly stocked and well managed, would suffice to furnish our present demand of 20 to 25 billion cubic feet. But we know that the premises do not exist. The manner of utilizing the product has also much to do in calculating the efficiency of the producing area. While, for instance, in the forest management of various German States the percentage of entire wood material may be said to be utilized in some shape or other; in the United States a very large

part is not utilized at all and left in the woods ; and while in the German forests from 40 to 65 per cent. appears as building timber, we learn that less than 30 per cent. is the yield from the red woods of the Pacific Coast ; and, take it all through, it is doubtful whether more than 25 per cent. of the actual wood in a tree is utilized in the United States.

In comparing supplies and demand, it would be a mistake to place reliance on calculations of the wood accretion upon the areas under forest cover, for it is quality of material that is demanded, and not mere quantity. Not only do areas differ in their wood-producing capacities according to climatic and soil conditions, but their composition as to kinds of trees and quality of timber determines their value. Thus, while the area of forest in the United States probably does not diminish now at as rapid a rate as it used to, the value of the remaining area is very rapidly depreciated, not only by removing the accumulated supplies, but by culling the best and leaving the inferior material, by neglecting to give attention to the reproduction of the better kinds, or even by recurring fires destroying the capacity for such reproduction.

The forest furnishes firewood, building timber and raw material for the arts.

In the United States more than three-fifths of the population uses wood exclusively for fuel, and to show the value and appreciation of this class of fuel in comparison with substitutes, it may be mentioned that in Germany during 75 years from the beginning of the century the price of coal has constantly sunk, while that of charcoal has constantly increased ; showing that the substitute not only did not displace, but did not even affect the valuation of wood as fuel. The bulkiness of the material when compared with its heating power is objectionable, but other qualities make it desirable.

For building purposes, although stone, iron and other materials are used more and more, the ease of shaping wood material, the rapidity with which it can be handled, and various other qualities, will insure the use of wood for that purpose for all time. In the arts the same qualities make the use of wood desirable ; and while substitutes in many cases are even preferable, in others the necessity for using them would entail grave inconveniences. The value of sawed wood material in the United States is calculated as round one billion dollars, representing an enormous amount of material. One of the drawbacks of the material is that it is comparatively

bulky, and hence it is desirable not to have to transport it too far, especially overland, but to produce it near the centres of consumption. In the United States, with many thousands of acres of virgin timber to draw upon, the price for lumber represents hardly more than the expense of getting it out and transporting it, the material itself not representing as yet any cost of production.

II. THE FOREST AS A CONDITION OF CULTURE.

The value of forest areas in influencing climatic soil and water conditions has been generally recognized only during the last hundred years.

While there exists, no doubt, under given conditions, a relation between forest-cover and climate, all generalizations in this respect must be taken with caution, until more proof and exact data is brought by scientific methods. Climatic conditions are, in the first place, due to cosmic and terrestrial influences. Of the terrestrial influences we know mountain ranges and water surfaces to be powerful. There is reason to believe, and some definite measurements sustain the belief, that as far as forest-cover interferes with insulation of the earth and the movement of air currents it renders the climatic conditions within its own borders different from what they would be were the forest-cover removed. The doubt can exist only as to whether and to what extent this difference can make itself felt outside of the forest. The claims are, that a forest-cover tempers like a water surface, and, to some extent, intercepts or reduces the force of hot and cold winds with all the consequence of such action; further, that it influences, if not the amount, yet in local and temporal distribution the precipitation of rain and snow, besides exerting various minor influences.

Whatever the truth—and neither the claimants nor the objectors to forest climatic influences have brought incontrovertible proof—it is evident that the extent, composition and location of the forest must have much significance in the matter, and also that the relation of the country towards other climatic influences must either increase or decrease the significance of this factor as a climatic element. In England, under powerful terrestrial tempering influences, any forest influence would be inappreciable by comparison; poor thirsty Spain, on the contrary, deprived by its situation of the effects of modifying ocean currents, might possibly modify the extremes of temperature under which it suffers by extensive forest

areas, which it lacks. While our own North Pacific coast, if stripped of her wonderful forest wealth, would not be appreciably deprived of its abundant rainfall brought by the ocean currents ; properly disposed timber-belts in our arid and sub-arid interior might, if they did not increase precipitation, at least check the excessive evaporation under which it suffers from incessant and unchecked winds. The cool and humid forest-cover situated on the slope toward the moisture-bearing winds may unnecessarily increase the tendency to condensation to which the currents by their mere descent are subject ; while if situated on the leeward side, it might recuperate itself from the moist forest air, the drained current coming over the mountain. Here, by obstructing the gentle south wind, it may keep a valley longer in the rigors of winter ; there, by cutting off the cooling breezes, it may make less bearable the heat of summer. So that an objectionable influence may be shown as well as a favorable one, according to local conditions.

With more assurance can we speak of the influence which the forest-cover exerts upon the soil and water conditions. Again, it is the location with reference to the configuration and geologic formation which imparts the value to the forest, and hence, again, generalization is not permissible. Here, where an excess of moisture due to subsoil conditions used to be removed by the process of vegetation, deforestation induces the formation of marshes, and in consequence unfavorable sanitary influences on the surroundings may result ; there, under different conditions, where evaporation had been checked by the forest, its removal reduces the humidity of the soil and the size and continuity of springs. Remove it from the shifting sands of the coast and the formation of sand dunes encroaching on the agricultural lands is induced ; burn the forest floor on the sandy gulf coast plains and you destroy its fertility ; burn the litter that accumulates under the forest-cover on the mountain slopes and the waters will run riot and gully the ground ; torrents, landslides, snowslides, avalanches are induced, washouts filling the valley and the river with debris, causing stow-waters and increasing, if not producing, floods. The significance then of the forest under given conditions as an important factor in the general conditions of a country cannot be denied.

Lastly, when we consider that forest-growth is capable of producing values on ground which cannot be utilized profitably in any other way, its significance as a national resource may be considered sufficiently established by this brief exhibit. This latter capacity

of forest-growth is of the more significance when we look over the world and count the waste places which man has produced. There are in France and Germany alone over 500 square miles of sand dunes, which France has shown, by a reforestation of nearly 300 square miles, can be profitably utilized. In Austria the waste places capable of reforestation are nearly 2,000 square miles; in Italy, 1,500; in France, nearly 10,000 square miles; in Great Britain and Ireland, over 11 per cent.; in Greece, over 15 per cent. of the area is waste, while in Germany only 2.7 per cent. Hence, of late, all these governments strive to bring these vast unproductive areas into useful occupancy. Prussia spends \$250,000 yearly in that direction. France has spent round \$30,000,000 within the last 25 years in recuperating devastated forest areas, and even Russia has, since 1843, reclothed over 50,000 acres of her steppe.

We have seen that, as a meteorological and cultural element, the location of the forest is all-important, and its most pronounced value as such element is found on the mountain-sides, on shifting sands and on the poorest soil, in general; that is to say, those locations where the material product must be necessarily inferior to that of better situations and where, therefore, forestry is least profitable. They are the very areas where private activity can find satisfaction only by reaping the natural crop. Yet here the danger from mis-management—that is a management in which no regard is taken of the simultaneous or immediate reproduction when the crop is harvested—must be the greatest, since the barring of the slopes and sand soils may mean destruction of fertility, not only of the bared but also of the adjoining areas, and increasing dangers from flood waters. Hence the interest of the community must be centered upon these forest areas.

It has been contended that the reproduction of forest-growth takes place of its own accord, and hence the interest of the State as far as material production is concerned, need be only of that general character which it has in all products and industries of the nation. This contention, however, is erroneous, if considered from an economical point of view. While culled and denuded areas do reproduce a wood-growth, this—in quality and especially in quantity per acre—is only in rare cases satisfactory and economical. The reckless squandering of material, the disregard of the condition of the area after being left by the lumberman, the practice of firing, and thereby destroying the young growth as well as the fertility of

the soil, are to a large extent detrimental to the reproduction of the resource, and experiences all over the world have shown that by such reckless policy recuperation can be rendered almost impossible.

As far as the production of material constitutes the forest a resource, it is not tree-growth merely but quality of the growth that makes it valuable, just as it is not the presence of iron but its sufficiency and quality in the ore, that makes the iron mine of value. The forest primeval contains much material which is of little or no value, and large areas are required to produce small amounts of good timber, but in its reproduction it can be improved in value and yield, and that without anything but proper use and management. The forest differs from agricultural and horticultural products of the soil in so far as the latter are usually improvements upon the natural product in kind, by human ingenuity and labor, while the natural product as found in the virgin forest satisfies the needs of man.

An important difference, too, and one which makes the use of the soil for forest growth as an economical element desirable, is, that while agricultural crops exhaust soils of their fertile elements, wood-growth does not rely on these to any extent, returns the larger amount of those utilized by the fall of leaves and branches, and improves thereby the soil for agricultural use.

The production of starch or sugar, and albuminoids, which is the object of agriculture, takes place at the expense of the minerals in the soil which are carried off with the yearly crop, while forest products, being in the main cellulose and its derivatives, are formed at the expense of the inexhaustible carbon of the atmosphere ; and, although small quantities of the rarer minerals are also required, they are used over and over again for processes of assimilation from year to year, since the crop is not removed annually ; and when it comes to harvesting, those parts of the tree which contain most of these minerals, the foliage and litter, remain on the ground. Thus a potato field for a medium crop requires three times as much of the rare phosphoric acid as a beech growth, five times as much as a spruce forest, and nine times the requirement of an acre of pine, while the consumption of potash is nine, thirteen and seventeen times, respectively, as great.

Hence the capacity of forest growth to utilize those soils which have been exhausted by agricultural use ; and by the deep going roots mineral elements are raised to the surface and the soil improved. Forest growth makes also less demand upon favorable

topographical and climatic situation, and will succeed where agriculture is no longer profitable or is impossible. Hence we may speak of absolute forest soils, that is soils which on account of their poverty, steep topography and climatic ill-favor are not fit for anything but forest-growth. The extent of what can be considered such absolute forest soil depends somewhat on the state of culture of the country. But it is a fact of highest national interest, that inferior soils and impracticable sites can be profitably utilized by forest-growth.

The main difference between forestry and other productive industries is the long period of production. From the time of planting to the time of harvest many decades may pass and a century may not be too long. As long as it is not only wood, but size and quality that is wanted, the factor of time is an important one, for it takes time to produce both size and quality. There are, to be sure, some uses for which timber may be grown in short rotations, as, for instance, where only firewood or posts or tanbark is wanted, but these uses are confined in extent.

When we consider not merely the virgin forest growth but a rational forest management, we find that it differs from agriculture in various financial aspects. In agriculture the soil alone is the standing capital or basis of production from which annually the interest is derived in the crop. In forestry the soil, plus a certain amount of growth, is the producing basis ; only a part of the growing crop can be utilized annually, the rest, remaining for further accumulations, must be considered as part of the fixed capital. This condition at least prevails where an annual revenue is to be derived from the business. It is of course possible to work for an intermittent revenue, waiting until the entire growth has reached the age for utilization, and after harvest starting the new crop for another rotation ; but this is not the most profitable way, and in the end it may be irrelevant financially, whether we conceive the growing crop partly as a capital or simply as an accumulation of revenue which we may not utilize. To make a regulated forest management possible and profitable, to yield sufficient annual returns and to occupy the manager fully, a larger extent of territory is required than in agriculture ; hence a larger standing capital is required. Agriculture, on the other hand, while needing comparatively small fixed capital, requires a comparatively larger running capital for expenses.

The existence of this stock in forest management places it in a

particular position with reference to insurance and credit systems and the question of renting. There are dangers threatening this stock which make forest property hazardous, more or less so according to locality, kind of timber, kind of management and moral sense of the population. In the United States the danger from fire makes forestry one of the unsafest industries, and theft, it would appear, endangers it about as much. Insect ravages are the bane of the cultivated forests of Europe. But what they will be in the United States—the El dorado of vermin—when forest management has begun in earnest and the damage is felt more severely, is hardly conceivable.

The damage differs in value with the age of the growth. Fire may destroy the accumulated stock and crop of centuries; insects may destroy the saplings, and grubs kill the young seedling growth. Windfalls or tornadoes may interfere with the regular system of management and may make a utilization of the stock necessary before its maturity, and thus occasion an overstocking of the market and decline of values.

While there are some dangers in agriculture, such as unfavorable weather, frosts, etc., that are not at all or to a less extent felt in forestry, it is there only one year's crop that suffers, while here accumulated stores are exposed to hazard.

Since the main value of forest property lies in the accumulated stock, the soil being mostly of inferior value, and this stock is most exposed to depreciation and depredation, it does not form a fit object for credit, nor is it for the same reasons a desirable property to rent. The stock is all the year round exposed to the depredations of others, hence it requires a comparatively large expenditure for protection simply. The existence of this stock is also apt to prove dangerous as far as the proprietor himself is concerned, for it offers a constant temptation to utilize it at the expense of a rational management. Necessity, folly, or miscalculation may easily diminish it, while to place it again upon its proper value and quantity is difficult. Hence, if it is in the interest of the community to maintain stable conditions of property, or where the forest partakes of the protective quality, more special care in regard to the laws regulating forest property seems necessary.

Roscher says:—

“Where the sale of property becomes jobbing, *i. e.*, where it is purchased not to be managed, but to be sold as soon as possible for the purpose of pocketing the difference in price, agriculture

declines ; but with forests such abuse of property in soil is much more dangerous on account of the characteristics of forest management, so that here slow change of proprietorship is proportionately much more advantageous."

The labor conditions in forest management are also worthy of note. Less labor is required here than in agriculture, since cropping and harvest recur only at the end of the long period of rotation, and the work of cultivation is connected mainly with harvest of material. Yet while few laborers are needed for their full time a large number is given work at a time when work in agricultural pursuits is slack. According to statistics from German Government forests, agriculture employs from ten to even thirty times as much labor per acre as forestry ; of the class of foremen, inspectors and similiar occupations, one man is needed for every 200 or 300 acres in agriculture, while to one forest-guard 500 to 1,800, and to one district-manager 5,000 to 15,000 acres are calculated. Altogether, the forest offers less employment to labor than agriculture ; the factor of nature has more sway in it. This may have been the reason, why everywhere, the idea of private ownership in this kind of property has developed slowly and less regard is paid to property rights in it.

Further differences between agriculture and forestry are found in the conditions of transportation and market. The bulkiness and heaviness of the material make transportation difficult and comparatively expensive, so that the cheaper grades, especially firewood, may not be profitably utilized. It has been figured out by a good mathematician (Little) that if it were necessary to convey the amount of timber annually consumed in America from foreign ports, the entire sailing tonnage of the world would be required. With undeveloped means of transportation, the market for wood is locally circumscribed, and hence unprofitable, an intensive utilization of the crop is precluded, and the best management often impossible.

As to profitableness of the business, this depends on so many factors and conditions that it cannot be easily determined in a general way. Although the profit per acre resulting from European forest management seems exceedingly low, it must not be forgotten that this profit is derived from the poorest soils and with little expenditure of working capital. In Prussia, for ten years, the revenue for the entire forest area of the Government was \$1.92 per acre ; in Saxony, \$5.60 ; in the very profitable forest manage-

ment of Zurich, \$6.45 ; and on about 10,000,000 acres of German Government forest areas, it averaged \$2.89, while agricultural land brought, according to crops, from \$8.75 (buckwheat) to \$96.00 (tobacco) per acre, annual income. Excepting, therefore, the poorer soil and special conditions and kinds of management (for instance, coppice management of short rotation for tanbark), agriculture is more profitable. During the long time necessary for production in forestry, the conditions may moreover change to such an extent that what appeared a profitable undertaking when begun, by change of circumstances becomes unprofitable. The difficulties in gauging and balancing supply and demand may also be considered greater than in agriculture. On the other hand, the possibility of delaying the harvest or cutting it earlier, according to market conditions, is an advantage in forestry. It is also possible to store the harvest without the detriment or expense which agricultural crops would entail.

Since forest management does not admit of rapid changes in plans and method, but requires a conservative and well-matured plan, not only should the forest manager command a considerable scientific education and knowledge, but he must have a determined character which is capable of carrying through a policy upon which he has decided. Forest management implies and fosters stability and conservatism. Having conceived the state as an association for the purpose of regulating and adjusting the differences of private and communal interests and rights, and having agreed that the preservation of favorable conditions for associated life, the interest of the future community, is as much the concern of the state as the protection of the present community ; we may now more specifically define the position of the state with reference to the forest resources.

The state must be guided by the principle, that as much latitude should be left to private activity and property rights as is compatible with the interests of the community, only when this activity and exercise of property right is demonstrably and directly harmful to communal interests is state interference called for. The individual must be guided by the familiar legal maxim, "*Sic utere tuo ut alienum non laedas.*"

With increasing population and more complex civilization, the friction of contending interests must grow more pronounced and more frequent. As elbow-room gets scarcer, elbows more frequently knock against each other and poke into the sides of neighbors.

Hence more points are discovered where interests are at variance, and the principle of preventing the use of private rights to the detriment of the community needs to be more carefully enforced.

While with a large virgin forest-resource to draw upon and a small population, in the United States the government paid but little concern to the disposal of forest land and forest supplies ; with a reduction of the latter and with increased requirements for the same, at least such ameliorative government action is called for as will aid private interest to utilize the resource more rationally and to better advantage for continued yield and future supplies. Since, in most cases, the resource is capable of restoration, the widest latitude to private activity should be granted, and the office of the state should be mainly directed to remove hindrances to a full development of a rational forest management and offer such positive encouragement as can be given by proper protection, by fostering educational agencies, and in similar ways. The state agencies which are employed to facilitate a knowledge of market conditions for agricultural crops and of crop areas are, perhaps, still more desirable in the case of forest areas and cut and demand, since it is more difficult to determine these.

As far as production of wood material is concerned—a profitable private industry—and the use of the soil in the most profitable manner, it may be presumed that private interest is identical with that of the community and will adjust itself accordingly ; although this axiom can hardly be said to be recognized everywhere, as the poor mountain farms in the Adirondacks and elsewhere show. It will, however, have been observed that the nature of forest property to forest management is such as to make large and continuous holdings desirable. Hence, if the state—the community at large—does not itself retain the ownership of its forest area, it should encourage the aggregation of large forest areas in the hands of strong capitalists, individuals or corporations.

The providential and restrictive function of the state is first called into play when, by the wrong treatment of a forest, a neighbor may be injured in the enjoyment of his own property, or when the cultural conditions of whole sections of country are endangered by the free exercise of property-rights on forest areas. Whether such injury is done or is to be expected from the unrestricted exercise of private rights is often difficult to determine. Our knowledge of the relation of natural agencies is by no means so well established as to allow us definite prediction. On the other hand,

there are certain conditions under which the consequences of forest destruction or forest devastation are so well understood that state supervision in one shape or other can reasonably be claimed to be rational.

The effect of the deforestation on sand dunes has been experienced in Southern France and elsewhere to the fullest extent ; just so the effect of mismanagement and deforestation of steep mountain sides, which demonstrably give rise to the pauperization of whole districts and communities, by washing off the soil, irregular water flow and increased flood dangers. Climatic influences, with the exception of reducing the detrimental action of winds, are perhaps less easily demonstrated.

Such forest property, then, cannot be left to the absolute control of the private owner. Since, however, he should be compensated for the restriction which he has to suffer for the public welfare, and since the damage done or to be expected may not always be easily proved or estimated in its extent and amount, the only proper solution is state ownership of the property. And by state ownership I do not mean to imply that the state or the general government should necessarily be understood ; I mean the community—be it state, county or township—the interests of which are at stake as against the private interest. To be sure as a rule, it will be found that the interest of several towns, counties, or even states are concerned in the control of private occupancy, and the strong, immutable, conservative central government will be found the best agency to control or own the mountain forests at least. Such ownership has the advantage of securing the object in view, while any restrictions of private rights are cumbersome and difficult to enforce. Besides, as such forests are situated mainly on the thinner soils, and rugged slopes of mountains, and, hence, are not only less profitably worked, but their reproduction is connected with difficulty and, if improperly treated, may become almost impossible ; they form a questionable object for private industry in which financial gain is the leading principle.

The states which have recognized most fully the need of Government control of the forest resources are the English colonies—notably those of Australia and India—states from which we can learn a good deal in methods of internal improvements. They have done more than consider the protective function of the forest, they have recognized that the uncertainty and great fluctuation of supplies which, on account of the peculiar nature of forest property, must result from private forest management, is undesirable,

and hence have reserved large areas and placed them under government management. All other civilized governments, excepting those of the American continent, have more or less applied the principles here laid down. Canada, while disposing of its forest supplies to private individuals, does so under restrictions, and reserves at least the land; Germany, with 32.2 per cent of state forest, 18.7 per cent. of communal forest, and 30 per cent. of the private forest under more or less state supervision, thus attempts to keep secure 65.5 per cent. of her forest area. Austria, France, Italy, Switzerland, all having state forests, also control the management of their protective forests, and the tendency everywhere is to enlarge the restrictive power of the state.

While here state-ownership and restriction of private rights is directed toward maintaining favorable forest conditions, the reforestation of devastated and treeless areas forms also a proper subject for the state. Such state action of an ameliorative nature would be based upon the principle, that the community should act where the exertions of the single individual or even voluntary association of individuals is powerless, or private interest does not find sufficient inducement to attain an important economic object, where the communal interest is better subserved by the action of the state, when permanent institutions are to be created and managed independently of personal whim, and the state alone can insure permanence, continuity and the accomplishment of the object. Hence the reforestation of the Western plains, for purposes of ameliorating cultural conditions, would be properly delegated to the state, especially as long as the state still controls the land necessary for such forest planting. Feeble attempts to encourage private enterprise in that direction have been made with little result, and much of the private energy expended upon the problem has been dead loss to the individual and to the nation, for the reason that only by concerted action on a large scale is successful reforestation in the arid regions to be expected.

The method of assisting private enterprise, in any other way than by creating opportunities, is the least commendable, creating as it does a paternalism which would be a bane to the development of proper self-government, and which is widely different from the communal spirit which the writer has advocated in his propositions.

Summarizing the special considerations and peculiarities pertaining to forest growth and forestry which may influence state action, they can be briefly stated as follows:

1. By its location upon mountain slopes, sand dunes and otherwise, the forest may represent a climatic and cultural condition of paramount importance, which renders its material value a secondary consideration.

2. By mismanagement or neglect the capacity for reproduction may be injured to such an extent as to make reforestation impracticable, if not impossible.

3. Forest growth improves instead of exhausting the fertility of the soil, and is capable of producing useful material on the poorest soils and sites.

4. By proper methods of utilization alone reproduction of the virgin forest superior in quality and yield can be effected.

5. Forestry differs from other industries in the long period of production, necessitating an accumulation of stock, which is exposed to various dangers for a long period of time, and hence renders the business hazardous.

6. Forestry requires large areas and a large fixed capital, but only small running capital. It employs little labor, but furnishes employment at seasons when elsewhere labor is less needed.

7. As a financial investment, forestry is beset with many drawbacks, which render it less desirable for private enterprise; the necessity of keeping on hand a large stock exposed to danger renders it not a desirable object for financial operations.

8. Forestry engenders and requires permanence, continuity of plans, management and conservatism.

REPORT ON THE ADMINISTRATION OF THE PUBLIC FORESTS OF QUEBEC.

E. E. TACHÉ, DEPUTY COMMISSIONER OF CROWN LANDS OF
THE PROVINCE.

The general administration of our woods and forests is not, in its main features, peculiar to the Province of Quebec, and, as it originated long before the Confederation, it is on the whole the same as that followed on the Dominion lands, in Ontario, and to a certain degree in New Brunswick.

With few exceptions in this country, the interest of colonizing the wild lands of the Crown and that of utilizing the products and resources of the forests for trade and commerce, have always been kept distinct. That is to say, the right to cut timber over the Government lands is granted by a permit to that effect, in the nature of a lease, but not, in any way, conveying permanent territorial concession. As the lots located for settlement are often derived from a territory under permit to cut timber, the interests of settler and lumberman sometimes conflict; and the desire to reconcile both interests has caused the enforcement of a few laws which are not always easy to apply for the benefit of all parties interested.

On June 30, 1890, the wooded lands subject to timber license covered an area of some 50,119 square miles, equivalent to 32,076,160 acres in superficies, eighty per cent. extending over tracts not as yet subdivided into townships and consequently not, for the present at least, exposed to the inconvenience just alluded to.

The territory subject to license is sub-divided into limits or timber berths, generally resting on a river or water course, having a front of ten miles by a depth of five. Latterly, to satisfy the demand, the sub-divisions have been reduced in area—from twenty to twenty-five miles—and a more regular form has been followed irrespective of the river frontage.

The right to cut merchantable timber over a specified area is authorized, controlled, and governed by the provisions of the 23d Chapter of the Consolidated Statutes of the former Province of Canada, as now amended and contained in our Provincial Statutes, in articles 1309 to 1352.

Since 1872, this privilege is acquired at public auction only, after due notification inserted in the Official Gazette and the principal leading newspapers, and, when adjudged to the highest bidder, is conveyed by a license renewable each year, on the accomplishment of certain strict obligations. The charges consist in the price of purchase and of the first year's ground rent, \$3.00 per each superficial mile contained in the limit or berth acquired, and, for its yearly renewal, that of the annual rent and of the stumpage dues levied on the quantity of wood goods that may be derived therefrom each season.

The timber dues, according to the regulations now in force, dated February 3d, 1888, for the staple of production, are the following:

Pine, birch, basswood, cedar, spruce, elm, ash, tamarac

and all other square timber, per cubic foot, . . . 2 cents.

Pine, sawlogs, boom and dimension timber, and all other logs or woods intended for sawing, except spruce, hemlock, cypress and balsam, per standard of 200 feet board measure, 26 cents.

Equivalent to \$1.30 per thousand feet, board measure.

Spruce, hemlock, cypress and balsam sawlogs, per standard of 200 feet, board measure, 13 cents.

Equivalent to 65c. per thousand feet, board measure.

The right to renew the licenses is guaranteed to the 1st of September, 1900, and the tariff of dues and the ground rent is to remain in the same or, at least, is not to be increased up to that date. This is defined by the Orders in Council, dated April 18 and 24, 1888.

In Ontario and at Ottawa, the right to renewal seems unlimited, but no engagements exist as regards any possible changes which may effect the tariff in the future.

By section 6, of Ch. XV. of 51 and 52 Vict., corresponding to article 1341 of the Provincial Consolidated Statutes, the words "merchantable timber" mean "white and red pine, spruce, tamarac, birch, white birch, and ash," to which species the limit holders are now restricted in their operations.

Moreover, by article 33 of the regulations of February, 1888, licentiates are no longer permitted to cut pine trees measuring less than 12 inches nor trees of any other kind measuring less than 9 inches in diameter at the stump.

Besides these precautionary measures, enacted to impede the total destruction of the forests at the hands of the license holders, the Legislature has also provided measures for the prevention of similar disastrous results at the hands of the settlers. Thus by 51 and 52 Vic. Ch. 15, sec. 3-4 (article 1339 Consolidated Statutes), a forest reserve of 20 per cent. is to be made on each lot of 100 acres sold hereafter for actual settlement. And further, in the interest of all, Government, limit holders, and settlers, the law, as far back as 1871, minutely defines the measures to be followed for the prevention of forest fires, and, in connection therewith, all the precautions to be taken in the clearing of land for purposes of settlement.

As the law, in its execution, was left to a great number of persons and not to one especially named for that object, and, in consequence, greatly lacked efficacy, the Province, by an act passed in 1883, and of another to the same effect sanctioned in 1889, (52 Vict.

Ch. 17), has been divided into seven fire districts, and a superintendent placed over each, with power from the Commissioner of Crown Lands to employ the necessary number of men for the suppression of any forest fires, a sum of \$5,000.00 is annually set apart by the Government for that service, and the licentiates, who are also interested in the preservation of their locations, are obliged to contribute a similar amount for the expenses incurred in this connection. This contribution, called "fire fee," is collected from the limit holders in proportion of the area held by each.

Lastly, to encourage the planting and cultivation of forest trees, the Legislature has provided, by 45 Vict. Ch. 13, "that whosoever "being the proprietor of and in possession of any land, shall plant "any part of such a land, not less than one acre in extent, with "forest trees, shall be entitled to receive in respect of every acre of "land so planted, a land-order which shall authorize him to purchase to such an amount not exceeding \$12.00, any of the public "lands which may be open for sale within the Crown Lands "Agency in which such trees have been planted, or should there "not be such agency, then in the nearest agency subject to the "law respecting Crown Lands."

It is by the same statute that "arbor day" has been established in the Province of Quebec, (see Cons. Stats., Art. 1359 to 1368).

At this point, I think I owe you a word about the "Forestry Reserve Act," now repealed, as I am not certain if the public of this Province ever realized what it meant. It was originally suggested by this Association at the congress at Montreal, in August, 1882, and though popularly deemed a measure hostile to colonization, it was really intended to direct it to the best advantage of the country. The principle at issue, was the reserve, for forest use, of all the lands which were most fit for that object, and to sell for colonization only all that was suitable for that purpose.

To make a selection, detailed and lengthy inspections of each lot were necessary, involving the suspension of sales in certain districts; and this momentary suspension was interpreted as an act of prohibition. Hence complaints and attacks were raised, which brought on the repeal of the law, but I leave it to the thinking public to judge if this measure was not imbued with all sound ideas of provident forethought; even if opposed to preconceived ideas about the grievances of the poor settlers.

To return to the management of our forest domain. For the administration of woods and forests, this Province is divided into

nineteen agencies, and to compass exactly the extent of our principal sources of production, a brief description of the most important of these districts will be found useful.

The "Upper Ottawa," comprises the upper northern valley of that river, extending from Lake Témiscamingue and the due North boundary line between Ontario and Quebec, to the West, as far as the division line of the waters of the Gatineau and Lièvre to the East, from the South on the Ottawa itself, extending to the height of land between the waters of the St. Lawrence and those of Hudson's Bay, to the North.

The "Lower Ottawa" embraces the Northern basin of the same river from that of the Lièvre inclusive to the West, extending to the North-East over the territory drained by the upper waters of the l'Assomption, Lac Quareau and Maskinongé tributaries of the St. Lawrence, and bounded to the North by the summit lands dividing the Ottawa water system from that of the St. Maurice.

The "St. Maurice" agency comprises the entire valley of that river, together with that of the "Du Loup" to the West, and that of the Batiscan to the East; the "St. Charles," the basins of the St. Anne, Jacques Cartier and Montmorency; the "Lake St. John," East and West, the territory watered by the Saguenay and the whole of its tributaries.

"The Saguenay Agency" comprises all that part of the Northern basin of the river and gulf of St. Lawrence from the Saguenay to Anse au Blanc Sablon, at the Eastern extremity of the Province. The others, of much less importance, are the "Gaspé," East and West, "Bonaventure," East and West, "Rimouski," East and West, "Grandville," "Montmagny," Beauce, "Arthabaska," "St. Francis" and "Magog."

The stumpage to be paid is ascertained as follows: As soon as winter sets in and lumbering operations are fully opened, the various forest rangers appointed in each agency, directed by the Superintendent, follow closely the cut effected in each shanty and also by the jobbers. They keep record of all they count and measure and revise the entries made by the cullers of the data which they could not otherwise gather. Their records, with those of the cullers, are all sworn to and are finally examined by the Superintendents, who has a direct control over all the movements of the rangers.

There are six Superintending officers for the whole Province, appointed for the proper execution of the present system of levying duty.

At first, the stumpage was imposed per log, classified according to a certain diameter; but now, as in Ontario and elsewhere, the logs or pieces are taxed on their actual contents reduced to board measure, a system more equitable and effectual, but also more costly, requiring closer surveillance, and a greater number of rangers to effect it.

Formerly the returns prepared by the operators' and rangers' report were examined by the Crown Timber Agents, under whom the lumbering was performed, but now the statements are addressed directly to the Department, where they are confronted with the books kept by the wood rangers, revised by the Superintendents. The accounts compiled therefrom are then sent to the producer and the local agents for collection.

The duty on square timber, which is generally all manufactured for the English market and floated to Quebec for shipment, is collected here by a special officer (who acts also for the Province of Ontario) on the specifications as to the contents furnished by the cullers' office of the Dominion Government.

When I entered the service, I was frequently told that at the rate of cutting followed, in 20 years there would be no more merchantable pine logs in the Province. The 20 years have elapsed and more, and the number and amount produced is greater than ever it was, and each year I find that larger quantities of pine timber are brought down and derived from limits that had already been pretty thoroughly worked forty or fifty years ago.

The total area of Government lands still vacant and not yet under timber license, as well as can be ascertained—our Northern boundary line being assumed to be at the height of land (a line which is extremely irregular and geodetically determined at a few points only)—is certainly not less than 75,000,000 acres, of which 40,000,000 may be deducted as destitute of timber, leaving 35,000,000 acres still untouched.

Out of that last named superficies, 3 to 4,000,000 may be safely laid down as pine-growing, the rest is chiefly covered with spruce, cedar, tamarac, white birch, cypress, birch, and maple. Those species, in the order where they each predominate, may be distributed as follows: The pine in the Lower Ottawa and the St. Maurice agencies, but principally in the Upper Ottawa Valley.

With respect thereto, to indicate the rapid increase in price which this valuable wood takes yearly, I may state that, at the last auction sale, held in January last, limits situate in the most remote and inaccessible section of the last named region, fetched the highest bonus ever obtained at any such public sale held before in the Province.

Excellent spruce, and in quantity, is to be found in the St. Maurice, Saguenay, Lake St. John, Bonaventure, Rimouski and Grandville agencies, as well as tamarac and cedar, the latter being particularly good and abundant in the three last named localities. Tamarac is spread evenly all through the divisions just mentioned. White birch is disseminated everywhere, but is especially plentiful in the St. Maurice Valley, and the Saguenay and Rimouski regions. Cypress and scrub pine, (Banksian pine), in the Saguenay region.

From surveyors' reports, this timber, which is well adapted for railways ties, covers the immense tracts of land watered by the Peribonka, Bersimis, Aux Outardes, and Manicouagan rivers and tributaries.

Then, beyond this Northern height of land, expands the vast wilderness that we now claim in part, and which, at an early date, will certainly fall within our frontiers. Although not all wooded, it contains large extents of timber-growing lands which, some day, will become within easy reach and then fully worth seeking after.

From the little I have said, we can, I think, soundly judge of the magnitude of our forest resources which may surely be set amongst the richest of this continent. They form the main item of our Provincial local revenue ; their existence, as a climatic influence, assures the fertility of our grain growing plains of the borders of the St. Lawrence ; their exploitation furnishes employment and living to thousands and thousands of persons of all classes ; they afford a rich market to our farmers, and moreover they comprise the bulk of our export, nine-tenths of the ships who frequent our harbors going back to all the countries of the world, laden with their produce.

In a financial point of view, the timber trade and the industries depending therefrom have greatly helped to make Canada, and they sustain Quebec. Without them, both would be reduced, at least for a time, to a state of comparative insignificance. This element, in our political economy as a nation, is of immense importance.

It is true that, to a certain degree, we may feel assured of a similar constant supply for the future as in the past, counting upon the physical construction of the upper Valley of all the Northern tributaries of the St. Lawrence, which makes of the greater part of our territory a natural forest region, and that the rigorous climate which pervades over those elevated plateaux render them in many places unfit for anything else, as they will not admit of extensive permanent self-supporting settlements.

It is, however, also undeniable that remarkable legislative and administrative measures have been and are constantly put into requisition for the preservation of our timber wealth; but there remains still something to be done, especially at a time when railway lines are being projected, constructed, and worked through the very centre of these formerly inaccessible regions; creating thereby new facilities for the working out of the tree products and also new factors of intended and accidental destruction. Certainly the subject is one which deserves our best thought and reflection.

ROCKY MOUNTAIN FORESTS.

EDGAR T. ENSIGN, FOREST COMMISSIONER OF COLORADO.

It is hardly necessary to say that the mountains are the most prominent physical characteristic of the Rocky Mountain region; and one cannot observe these attentively without noting the presence or absence of their natural covering, the forests. Again, in connection with the forests, it is difficult to overlook the intimate relation existing between them and the streams flowing from their midst.

Location and Area. The forests of this region, mainly coniferous, are usually situated upon the mountain slopes, at altitudes varying from 4,500 to 12,000 feet above the sea; in some cases at 12,500 feet.

The forest areas, though large in themselves, are not so if compared with the area of the entire region, nor are they to a considerable degree contiguous. There are, at present, no means of determining accurately their bounds and extent. Approximate estimates only can be given, based mainly upon statements re-

ceived from residents in, or persons having special knowledge of, particular portions of the region. According to the best data obtainable, and including in the estimate all kinds of forest growth, light and heavy, valuable and inferior, the approximate forest areas, in square miles, of the several divisions are as follows:—Idaho, 15,990; Montana, 26,285; Wyoming, 12,060; Utah, 6,000; Colorado, 16,625; New Mexico, 12,500; Arizona, 10,300; the total being in round numbers 100,000 square miles, or 13.2 per cent. of the total land area. It will be seen that Montana has the largest forest area, and Utah the smallest. The bulk of this forest land is still owned by the Federal Government.

Forests and Irrigation. The direct connection between western forests and the agriculture of the region is evident. The mountain forests nourish and protect the streams, and the streams are vitally necessary to the maintenance of the vast irrigation systems already established or in progress. In each of the Rocky Mountain States and Territories the largest and most important agricultural operations are conducted by irrigation. If it be true of any region that "the forest waters the farm," it is doubly true of that under consideration. It is estimated that the area here already covered by irrigating canals exceeds 6,000,000 acres.

Forest conditions. Upon the mountain ranges are irregular masses of coniferous forests, separated by wide spaces—the latter treeless, or sometimes clothed with a growth of aspen, stunted conifers, or shrubs. Bordering the streams are cottonwood, willow, alder, and other deciduous growths of minor importance. Scrub-oak and cedar, sage-brush and other shrubs—in rare cases a scattering growth of timber—are found on the foot-hills, mesas and plateaus.

This region, though nearly surrounded by arid or semi-arid plains, and subject, more or less, to conditions of aridity, heat and cold, inimical to forest growth, receives in many parts a comparatively large precipitation of moisture, and has abundant sunshine through a large portion of the year. To these last named causes the relatively extensive forests are due, and but for the scourge of fire these would probably be at least one-third greater in extent. Upon the western slopes of the mountains the annual fall of rain and snow is greater than on the eastern; hence the larger and more important forests are found there. Furthermore, the forests of that region have suffered less from fire and depredation than elsewhere. In all parts of the mountain country, northern ex-

posures are the most favorable to forest growth, as affording maximum conditions of moisture and a minimum degree of evaporation.

Among the most noted Rocky Mountain conifers are the White Fir (*Abies concolor*), the Silver Spruce (*Picea pungens*) and the Creeping Juniper (*Juniperus procumbens*).

Destructive Agencies. Where the mountain sides have been stripped of forest covering, violent storms of rain and wind have had a powerful and disastrous effect. The light surface mould has been blown away or carried downward to the valleys, and this has often been followed by masses of sand and gravel. Where once stood noble forests, are barren, irreclaimable waste, seamed and furrowed by torrents.

The demands of settlement, mining, lumber manufacture, railway construction, charcoal burning, etc., are making heavy draughts upon the western forests. All of these, however, might be met without serious or irreparable injury, were it not for the scourge of fire. It is safe to say that this agency—in the region named, is more destructive than all others combined. The evil will not be abated until wise laws and an enlightened public sentiment shall secure proper and effective forest administration.

Conservative Agencies. The reforestation of the denuded timberland of this region is extremely difficult, and in some localities practically impossible. Nature does much in such cases, however, and though the original species may not be reproduced, an inferior growth often appears. The extent of natural reforestation varies greatly in different sections. In New Mexico and Arizona, where greater degrees of heat and aridity prevail than farther north, the second growth is proportionately less in extent and vigor. Where fierce forest fires have scorched the ground and destroyed the vegetable mould, the difficulty of reforestation is greatly enhanced.

What has been said herein concerning reforestation relates to spontaneous growth only. While the necessity is great for reforesting the denuded slopes, the expediency of attempting here the artificial planting of large tracts is doubtful. If men will cease their destructive operations, and extend a protective hand over the forest regions, nature will repair in a measure the injuries of the past. In truth, most kindly healing processes are already begun. The ubiquitous aspen, with its light summer foliage and brilliant autumn hues, gives grateful shade and moisture to wide areas which otherwise would be barren and desolate. The dwarf maple, creeping juniper, wild rose and other hardy shrubs are also helpful

in the restoration of denuded surfaces. In the midst of these minor growths, the seeds of the pine, spruce and other timber trees gain lodgment and find necessary protection.

Although the forests of the region are suffering loss and depletion from many causes, there is reason to hope they may be saved from total destruction. Among the agencies tending to their conservation may be named the partial protection afforded them by the federal and local governments, the work of the American Forestry Association and a few State forestry associations, and the influence and teaching of the public press, which, in its collective capacity, advocates forest reform.

To the Commissioner of the General Land Office, under the Secretary of the Interior, is entrusted the care of the timber as well as other public lands, but with insufficient means to protect the public forests, which suffer accordingly. In the Department of Agriculture there is a Forestry Division, the functions of which, however, are almost wholly advisory. Its work, within the prescribed limits, is effectively performed, and much good has resulted therefrom.

The Colorado forest law, which was enacted five years ago, creates the office of State Forest Commissioner, and constitutes the County Commissioners and road overseers, throughout the State, forest officers in their respective localities. It is the duty of these officers to protect from fire and depredation, so far as possible, the public forests, and to promote by all legitimate means, the planting of forest trees. In as much as the State authorities have no direct control of the public timber lands, their duties are more largely advisory and educational than administrative. In the prevention of forest fires and depredation they co-operate with and assist to some extent the federal officers.

Forest tree planting, which, under existing laws, is confined to individual enterprise, though beneficial to the extent practiced, is unlikely to make good the deficiencies caused by forest destruction. In fact, groves and plantations of trees on the lowlands, however extensive, cannot perform the office of forests in the mountains.

Arbor Day has legal recognition in Colorado, and its observance there and elsewhere has an excellent effect.

The manifold uses and varied products of our forests, and their relations to climate, streams, and irrigation need to be more fully realized, so that their wasteful use and wanton destruction may be stopped. Let us hope for the coming of a better day.

FOREST ADMINISTRATION IN FRANCE.

H. L. DE VILMORIN, PARIS.

In France, the administration of forests forms a part of the Department of Agriculture, after having long been connected with the department of Finance.

It consists of a General Director who resides at Paris, of "*Conservateurs*," each of whom takes care of one of the great forest districts into which the whole country is divided, and of "*Inspecteurs*" who fill the local posts under the *Conservateurs*. "*Gardes-généraux*" are the younger officers of the organization, and have head-keepers and ordinary keepers under them.

The special forestry school is at Nancy, and its reputation such that many young men are sent there by foreign governments for instruction. The course of studies comprises not only geology, botany and natural history in all its branches, but also meteorology, engineering, political economy and administrative law. The pupils are admitted after a competitive examination, unless they have gone through the complete course at the Institut Agricole, our highest agricultural college.

The duties of officers in the forestry service are many and important.

1. They have to look to the preservation of State forests proper, to protect them from damage, and from encroachment by individuals or communities.

Our national forests, are mostly part of the former royal domains, but some, till their confiscation at the first revolution, belonged to "*émigrés*" or the great religious communities, who were often more experienced and able land-owners than the men of to-day.

2. The officers must decide how each section of the woods entrusted to their care is to be made most profitable. There are two classes; copse or bush wood, and high-stem or standard trees.

Copse wood, mostly used for fire wood, which the comparative scarcity and consequent high price of coals makes with us one of the great necessities of life, is cut after periods extending from seven to forty years, mostly twenty to twenty-five. The standard trees are felled after 80 to 200 years, either all at once, or by picking out some choice trees every year, or an intermediate system is adopted, by which a few trees are spared on each acre at each

period of cutting, to provide seeds and at the same time some matured timber over the underwood. The officer must apply to each particular section the system likely to provide the largest supply of wood, the largest returns in money, and at the same time ensure the growth of seedlings to take the place of the felled trees.

3. Each separate allotment, when ready for cutting, is put at auction, and the forestry officers regulate the size and number of the allotments, and designate trees to be cut. They have besides to watch the operation of cutting and removing the wood and timber, in order to protect the remaining trees from damage.

The leasing of state forests to sportsmen produces, especially near the great cities, an important revenue. While the yearly income from one acre of forest is on an average not much over two dollars, as much is sometimes given, around Paris, for the shooting lease over the same area ; and the lease-holder is moreover bound to fence in all the parts of the wood which are under three years growth, the forestry officers seeing that all the conditions stipulated in the leases are strictly carried out.

4. The work of filling the gaps in old forests is effected either by sowing in patches or planting in holes or trenches the kinds of trees which it is found advisable to propagate. By those means a change is often gradually effected in the composition of the forest, evergreens being substituted for deciduous species, or vice versa.

5. A fifth series of duties embraces the construction of roads, bridges, sledge-ways or wire cable systems of transport over deep chasms or torrents. There exist still in France some mountain sides covered with splendid old fir trees, which cannot be used for lack of means of carrying them either on land, by water, or through the air.

6. Another duty of the forestry officers is to control the management of timber lands owned by communities, especially in the mountainous districts. Such lands are under the "*régime forestier*," that is, under the authority of the national forestry officers, to avoid the destruction of woodlands through reckless cutting, and the damage to young growth by injudicious grazing.

The services so rendered are all the more important as the wanton destruction of forest in hilly, and especially in mountainous districts, often causes floods, accompanied by great loss of property and life.

The effect of stripping the heights of their natural coat of forest

is felt not only on the distribution, but also on the amount of rainfall. Some districts in my country, which were quite fertile and flourishing during the Middle Ages, have become quite barren and burnt up, and the cause of the change has been clearly traced to the destruction of forests on the surrounding heights. Such destruction mainly took place during modern wars, or at the time of the great revolution.

It has been one of the principal endeavors of the recent governments in France to re-establish forests where they had existed in former times, and especially where their influence could be most beneficial in making the rainfall and the flow of the rivers more regular. The results achieved are already comparatively large, and great credit is due to the central administration for its energy and perseverance in prosecuting this work in the teeth of numberless difficulties, political and material.

Men must sometimes be benefitted against their will, and an instance of this is found in the opposition offered by some of the communities on whose territory the work of planting new woods is carried on. The material difficulties are not less. Often the bare rock is exposed, the soil having been washed away, and then the work can be commenced only on slopes and on the banks of torrents. Stakes are driven among the stones, and willow twigs and branches are interwoven so as to form a sort of fence, which stops the earth and loose stones, on which, after a time, fir, pine or larch trees are planted; and slowly, but not always surely, the extent of the new plantation increases, and finally the torrent is turned into a gentle stream, while the overhanging slopes gradually become more or less densely wooded.

Great has been the work in this direction on both banks of the Rhone, on the Provence and Auvergne mountains, in the Pyrenees, and chiefly in the Alps, on the Durance river and on its numerous tributaries, work the benefit of which will be mainly felt by future generations.

A striking instance of the usefulness of the forestry service may be seen in the Landes de Gascogne, where for years the sand, driven by the west wind, kept moving on from the coast in huge sandhills, which buried fields, farms, and even cities. Decisive steps were taken to stop its inland progress about 1825. The engineer, *Brémontier*, protected the surface of the sand hills with branches of the common broom (*Sarothamnus scoparius*) simply pegged in, and under that light shelter he succeeded in germinat-

ing seed of the cluster pine (*Pinus pinaster*). The work of coating the sand hills with vegetation being begun near the beach, the task of establishing woods more inland was comparatively easy, as the outermost belt of pine trees effectually sheltered all the sections in the rear from the high winds and the drifting sands. In this way many thousand acres were covered with the cluster pine, which furnishes valuable timber, besides large quantities of tar and turpentine, so that the Département des Landes, once among the poorest in all France, though one of the most extensive, has become one of more than average wealth.

The forestry service has also promoted the creation of resinous and deciduous woods in the swampy province of Sologne; and in Algeria has introduced the Eucalyptus and wattle acacias, and developed the cork oak forests. The success of this service is due to its highly scientific organization and the ability of its leading members.

Now would a corresponding, not to say similar organization be likely to prove useful in America? I think so, for many obvious reasons:

1. The demand for wood is likely to increase with the population, if not in the same ratio. The use of iron and steel will not reduce the consumption of wood any more than the establishment of railroads interfered with the demand for wagon or cart horses.

2. The natural forests are certainly being reduced in number and in extent. Otherwise it would not pay to cut hickory stumps left at a first clearing, as I understood was recently the case.

3. Whether the object in view is simply the preservation of existing forests or embraces the creation of new woodlands in such localities as can pay better in wood than under the plough, it would be of paramount importance to entrust the control of the whole work to an eminently scientific body, as no guess-work should be allowed in a matter of such deep interest, where the selection of trees for each place should be guided by a perfect knowledge of the geological, climatic and economic circumstances of the district.

There can be no reason why America, which has done such admirable work in the promotion of scientific farming during the last decade, should not exercise the same judgment and the same enterprise in establishing scientific forestry.

TREE PLANTING ON THE PRAIRIES.

HON. H. G. JOLY DE LOTBINIÈRE, QUÉBEC.

The settler on the prairie finds the ground free of trees and ready for the plough, but if he understands his true interests he will devote to the planting of trees some of the time which in the East he would have had to spend in uprooting them. He must not only plant trees for lumber and fuel, or for the beauty which will remind him of the home of his childhood: the trees will also protect his fields against those winds that suck up the dampness out of the soil, and will contribute to prevent the drought so frequent in the prairies.

Belts of trees on the prairies, across the line of the prevailing winds, would greatly tend to diminish the violence of the blizzards. But I do not assert that thickly planted around growing crops they would reduce the danger of night frosts. There is considerable doubt on that point, they may even possibly increase that danger, as stated in a recent letter by Mr. George S. M'Tavish, for many years a chief officer of the Hudson Bay Company.

What trees are we to plant on the prairies? How are they to be planted and cared for? There is much to learn on those points, and the sooner we learn the better.

The Dominion Government and the Canadian Pacific Railway are now making experiments which will prove of much value. I am indebted to Mr. Shaughnessy, Vice President of the C. P. R., for the following information which he has just sent by telegraph:

"Experiments in forestry have been conducted for two years past at twenty-five points along the line of the C. P. R. The most important of these are at Moose Jaw, Swift Current, Gull Lake, Crane Lake, Maple Creek, Medicine Hat, Bowell and Langdon, covering a distance of over four hundred miles. The following trees have succeeded best at these points: Box Elder, American Elm, White Ash, Green Ash, Norway Maple, American Mountain Ash, European White Birch, Yellow Birch, native Poplars and Willows, Scotch Pine and Spruce trees from the foothills of the Rocky Mountains. By the free use of these trees shelter belts and ornamental clumps can be planted successfully on most parts of the great plains."

Both the United States and the Canadian Government have attempted to encourage the planting of trees on the prairies by grants of land, but this plan has not proved successful.

Trees are found on the prairies in the immediate vicinity of the streams, which shows that the soil is not unfit to grow trees wherever there is sufficient moisture. I may be allowed here to quote from Colonel Ensign's report of 1887-'88, the opinion of an experienced agriculturist, who shows that trees can be grown in arid and semi-arid districts without irrigation :

"A correspondent who has a timber-culture claim on government land in the eastern part of the State, asks: Can timber be grown here without irrigation?

"We answer, it certainly can. But we must reverse the system of eastern tree culture. There our trouble existed in the excess of surface moisture, requiring drainage from the trees. In preparing for tree planting the land was deeply plowed, thrown up into narrow headlands and the trees planted on the highest part, so the surface water would drain from the trees into the middle, a 'dead furrow,' and be carried from the field.

"Here we must adopt a system of surface drainage to the trees.

"This is done by planting in the 'dead furrow' instead of on the headland. By reversing this order of planting, trees not only receive the benefit of the rain-fall, but the snows drift into this 'dead furrow,' protecting the trees through the winter, and thoroughly soaking the ground when melting in the spring. In addition all manner of decaying vegetables drift and collect in this low ground, forming a valuable mulch to retain moisture."

However that may be, it is evident that we have a great deal to learn from experience before tree planting can be carried on successfully on the prairies. The expense of experimental stations conducted on scientific principles may be great, but it has become necessary. In the meantime we can acquire a great deal of useful practical experience with a relatively small expenditure. Scattered over the western prairies of the Union there are a number of military stations, and over the prairies of Canada many posts are occupied by the mounted police. Why not employ the men in planting trees at these stations? Many among them would soon take a pride in the trees planted with their own hands, and pleasure in beautifying the wilderness in which their lot is cast. Nothing is cheaper than starting a nursery from seed, especially when the labor can be procured as cheaply as in this case. The men

might be provided at a small expense with any quantity of seed and a few tools ; they might be shown how to start the trees and cultivate them, and those who did the work would have the privilege of selling them to the settlers. There is a general demand for young trees for planting all over the northwest.

I am convinced that if some officer in the prairie stations would set the example, he would find among his men more than one who would be glad to help for the sake of relieving the monotony of their existence and for the profit it might bring them. Let them start their plantations, watch the growth of their young trees and tend them carefully ; they will become an object of ever growing interest for them, and make their lonely life happier and better.

SYSTEMATIC TIMBER-CUTTING IN QUEBEC.

J. X. PERRAULT, SECRETARY OF THE QUEBEC FORESTRY
ASSOCIATION.

Now, while the destruction of the state forests is carried on so systematically that it is possible to foretell the fatal moment when the province of Quebec will be stripped of its most valuable forest-trees, it is a public duty to make a last appeal to the patriotism of the men who govern us to put an end to the vandalism of which we are every day the witnesses.

For more than a century the public domain has been pillaged with the thoughtless consent of the state. What was once the finest forest-property in the world has been ruined by pasturage, and by the wasteful methods of lumbermen who, not content to make enormous fortunes at the expense of the Province, have cut and destroyed everything in their path without thought of the future.

Our neighbors in the United States have acted with the same want of forethought, but with this difference, that with a population ten times larger than ours the destruction of their forests has gone on more rapidly. Never, perhaps, in the history of any people has there been seen the administration of a public domain so criminal and so disastrous. The forests of the United States, from

the Atlantic to the Pacific and from the frontiers of Mexico to those of Canada, cover 450,000,000 acres. The annual cutting over of 25,000,000 acres gives on an average 4,800,000,000 cubic feet, of lumber. The railroads use, in addition, 500,000,000 feet, the mines 150,000,000, fences consume 500,000,000; 150,000,000 feet are exported, while 18,000,000,000 feet are consumed as fuel. The whole forms the enormous total of 24,000,000,000 feet, of an approximate value of \$1,000,000,000—that is to say, more than the total value of the crop of wheat, rye, oats, potatoes, cotton and tobacco produced in the United States, and thirty-three per cent. more than the value of all exportations of every kind from that great country.

It is hardly conceivable and yet it is true, that no forest-administration has been charged with securing intelligent management of this colossal property. It has been truly said that the real riches of a country are not in its deposits of the precious metals, but in its forests, and yet, thanks to the folly of the Government of the United States, these fruitful sources of public wealth have been allowed to perish without any thought beyond the morrow.

Some idea of the enormous traffic which springs from the forests of the United States may be gathered, perhaps, from the fact that in Chicago alone the 2,000,000,000 feet of wood and lumber which are handled in that market represent 1,000 car-loads for every working day in the year. If all the forest-products of the United States were moved by rail, we should have a train equal in length to eleven times the circle of the globe at the point of its greatest diameter. The northern states alone produce two-thirds of this lumber each year, or about 20,000,000,000 feet, worth three hundred millions of dollars. This represents a weight of 500,000,000 tons, and would require a fleet of 500,000 vessels, each of 1,000 tons burden, to transport it—that is, a tonnage equal to twice the fleets of the entire world.

This forest-wealth of the United States has been so used and abused that already the richest forests have disappeared. The pines of Michigan, Wisconsin and Minnesota, once considered inexhaustible, exist no longer. They have been exterminated; and this is readily understood when it is remembered that a single mill in this region has cut half a million feet a day, and that the capacity of all the mills of the United States is more than 60,000,000,000 feet a year. According to the Census report, there were in 1880, 55,175,000,000 feet of pine standing. Since that time

45,475,000,000 have been cut, so that in all the northern part of the United States there is now only two years' supply of white pine of the best quality left, with more or less pine of inferior quality. The improvidence of the Government, and the insatiate desire to grow rich rapidly, have brought our neighbors' forests into this condition. It seems almost incomprehensible that a nation so intelligent and practical can allow itself to be despoiled of one of the principal sources of national wealth while it was so easy to render it perpetually productive.

And what have we done ourselves here in Canada? Have we not committed the same blunders? Has not our public domain been pillaged also? How many millions have been sent from Canada during the last fifty years to enrich the people of London? Our pine-forests have nearly disappeared. The timber of which we were once so proud has vanished. The pine, which is now found only between the Red River at the west and Migen at the east, does not extend north of the forty-ninth degree of latitude in the valley of the Ottawa, and the fifty-second degree in the region of Albany Lake. There is none north of Lake Superior. Our best pine-forests were in the valleys of the Ottawa, of the San Maurice, of the Saguenay and their tributaries. All these have been destroyed, and now it is necessary to go 300 miles from Ottawa to the head-waters of the San Maurice and to Lake St. John to find lumbermen at work. All that immense forest-territory of the province of Quebec, of more than 100,000 square miles area, would represent to-day hundreds of millions if the state had managed it intelligently. But here, as in the United States, every one supposed our forests were inexhaustible. They have been cut without pity and without rest.

The Government was deaf to every appeal to protect the public forests as long as a few hundred thousand dollars, derived from the forest, was available to make up the deficit of the general administration. The sale of limits made often to political partisans, most often fraudulently and at prices absolutely ridiculous, have almost entirely ruined our forests. Great bodies of timber have been sacrificed at ridiculous prices in time of panic when there was no demand for timber. In 1844 the Government, among other limits, sold one of 100 square miles for \$4 a square mile—that is to say, at the rate of two acres for one cent. Is it possible to imagine any greater folly in the administration of Government affairs? The results of these wasteful methods are apparent. The cut of pine east of Montreal, which amounted two years ago to 250,000,-

000 feet; has now fallen to 25,000,000—that is to say, to an annual output of only ten per cent. of the former production—and this for the excellent reason that there is no more pine to cut in that region. It is the price of the ruin of the forest-capital of the province which the government of Quebec has received and still receives every year. We have obtained as a gift from our fathers a forest-domain unequaled in the world. It was able every year to produce an enormous revenue, sufficient, if properly administered, to meet all the expenses of the state. And we have not been sufficiently intelligent to administer this property in such a way as to perpetuate the revenue for our children. On the contrary, without regard to the most elementary rules of forest culture, we have alienated the forest-domain by throwing it open to a crowd of greedy speculators whose only aim has been to destroy it entirely. Such criminal conduct merits the contempt and reproof of the whole world. The province of Quebec is not alone culpable. Ontario, New Brunswick, Newfoundland are even worse off than we are, and when the forest-resources of the Canadian confederation are examined, it is only too apparent that in a comparatively short time we shall be obliged to depend for our timber upon other provinces. British Columbia, on the Pacific side of the continent, is well wooded, but her forests are too remote to be of practical value to us here in the east. The timber supply of British Columbia will be needed by her own people and by those of the north-west. Her timber can be sent to Australia, California and South America more advantageously than to us here. From the Rocky Mountains to Lake Superior timber is scarce. It is disappearing rapidly in Ontario; and in the maritime provinces and in all the eastern counties consumption is increasing and the supply is disappearing very rapidly.

It is evident, then, that the province of Quebec must adopt at once the methods which are everywhere recognized as necessary to stop this destruction and assure by means of an intelligent administration the perpetuity of what remains of our forest-domain. It is necessary, in a word, to inaugurate here a system of regular cutting such as is practiced in France, Germany and other civilized countries, where not only the annual output is preserved, but the extent and value of the forests are steadily increased. The government of Quebec should, in order to preserve its forest-domain and increase for all time its productive capacity, adopt the following plan:

First. It should divide the public domain into five great forest-

regions—namely, Ottawa, San Maurice, Saguenay, the counties of the east and Gaspé—and place each under the direction of a general forest-officer. Each of these forest-officers should then divide his region into as many forests as there are distinct regions, each composing a certain number of limits.

Each forest should be worked, under the direction of a forest-officer of the region, by a timber-merchant, owner of a saw-mill, and such a forest should be cut once in every twenty years or more, according to the nature of the soil and the trees which are found in it. In this way every year a twentieth part only of the forest would be worked; the remaining ninety-five per cent. should be left to its natural growth and protected against all inroads from the lumberman or his employees. By only cutting each year trees which have arrived at their full value, those preserved would be ready for the axe twenty years after. In this way a forest will perpetuate itself indefinitely, yielding constantly an equal and regular annual product without deterioration.

Second. Every year the Government should determine what will be the amount of timber called for by the needs of commerce in order to avoid the over-stocking of the market and the commercial disasters which result from over-production and the consequent shrinking in value of forest-products.

Third. As is well known, the squaring of timber in the woods, by which the soil is covered with chips, is an imminent cause of fire, and a third of the wood moreover is lost by this means. The Government should demand that all trees should be sawed, not hewn, or floated down the streams in convenient lengths to points of shipment.

Fourth; The Government should exercise an intelligent inspection over the operations of lumbermen, and it should be the duty of the general forest-guards of each region to mark themselves, or to have marked by their assistants, all trees to be cut or to be reserved in the annual cutting.

Fifth. The Government should send to the Forest-School at Nancy a certain number of young men who, having followed the course there in forest-studies, would be fitted later to assume the direction of our woods and forests.

Sixth. As the management of our woods and forests belongs to the department of the Minister of Agriculture, the general forest-guards should be placed under the direction of that officer in all matters relating to the valuation and exploitation of the forest-domain.

It will, perhaps, be argued that these indispensable forms will entail serious expenses on the Government. This is a mistake. It is simply a redistribution of duties and a transfer of the Government employees, which is necessary in order to put this system in operation. And after all, a forest-domain of 50,000 square miles is well worth the trouble and expense of some attention. It produces annually something like 400,000,000 feet of pine and 110,000,000 feet of spruce, besides 37,000,000 feet of red and white pine timber, 600,000 feet of hard wood, 4,500,000 railway ties, besides vast quantities of cedar, tamarack and 5,000,000 feet of fire-wood ; the whole producing a revenue to the province of a million dollars. The total annual forest-product for all Canada amounts to \$25,000,000, and this will double certainly as wood becomes rarer in the United States. In a few years from now the province of Quebec will obtain from her forests a revenue sufficient nearly to meet all her expenses, provided an intelligent forest-administration can be established. We still have in our forests and in our waste land hundreds of millions of dollars with which can be assured the greatest prosperity of the province, but it is necessary that the men who govern us should realize the urgent necessity of administering wisely this magnificent inheritance upon which depends the future prosperity of the nation. And especially is it necessary that they consider the rights of the coming generation and determine to protect this inheritance against the attacks of the shortsighted and thoughtless.

EFFECT OF FOREST-MISMANAGEMENT ON ORCHARDS.

B. E. FERNOW, CHIEF OF THE U. S. FORESTRY DIVISION,
WASHINGTON, D. C.

I do not intend here to rehearse the influence which the forest exerts upon fruit culture by reason of its protection against cold and hot winds. The value of a properly disposed shelter-belt for the orchard is well understood. It was by opening up the country to the sweep of the northern winds that the cultivation of the olive in northern France was made impossible, and other such re-

sults of injudicious deforestation of local as well as general character, are on record. I wish now to show that not deforestation, but the mere mismanagement of the forest in the way of leaving large parts of felled trees in the woods and in allowing fires to run through the woods, works injury not only to the forest itself, but to the neighboring orchard. It is well known that a large proportion of the beetle larvæ which infest living trees cannot exist in a thoroughly healthy and vigorously growing tree; those larvæ in particular which are found in the cambium layer between the wood and the bark would be drowned in the sap of healthy trees. They are, therefore, mostly found in those trees which, for some reason or other, are less vigorous or on the road to decay. When a fire has run through a pine forest, or when a leaf-destroying caterpillar has ravaged the foliage and thus reduced the vigor of the trees, these beetles find a most favorable breeding place in the weakened trees, and their larvæ multiply rapidly and finish the work of destruction in a short time. For this reason it is often necessary to cut millions of feet of lumber and cordwood at once, or it will be entirely ruined. While, then, these little insects, belonging to the families Bostrichidæ and Scolytidæ, are great enemies to the forest itself, there is no doubt that many of the insects injurious to our fruit and shade trees find their most favorable breeding place in the trunks and limbs of the scorched or freshly felled trees. The frequent forest fires and the failure of the farmer and lumberman in disposing of large parts of the felled trees must be considered as among the principal causes of the prevalence in North America of these insect borers. The horticulturist may destroy the borers in his orchard or vineyard, but the mismanaged and maltreated forest makes a fertile breeding ground for them and replaces those destroyed by the watchful orchardist.

To substantiate the assertion, the following examples may be cited:

One of the most dangerous enemies of the orchard, the Flat-headed borer (*Chrysobothris femorata*), is found to breed in enormous numbers within the trunks of various forest trees that have been injured by fire.

The Oak-pruner (*Elaphidium parallelum*), which does considerable injury to apple trees, is found under the bark and in the wood of oak, hickory, elm and other forest trees that have been recently felled and left in the woods, or that have been reduced in vigor by fires.

Several other species of the same family, among which are *Prionus laticollis*, the broad-necked Grape-root borer and others, often injurious to the roots of the grape vine, breed in the trunks and stumps of forest trees, especially oak. *Pelidnota punctata*, a large Scarabæid beetle, which destroys the foliage of the grape vine, comes from the same breeding place.

One of the dangerous enemies to cultivated blackberry bushes, *Agilus ruficollis*, the red-necked blackberry borer, preferably breeds and multiplies in the wild blackberry and raspberry bushes that have been scorched by fires. *Amphicercus bicaudatus*, the apple-twigg borer, very injurious to apple and other orchard trees by boring in the twigs, breeds in the roots of the *Smilax* vines which have been killed by fire.

The various species of bark-borers of the Scolytus family, which attack orchard and shade trees, could be readily kept in check, but for the fact that they breed unmolested and multiply in fallen forest trees. Such are the Pear-borer, *Nyleborus Pyri*; the Pear-blight Scolytus, *Phlacotribus liminaris*, and the Apple Tomicus, *Monarthrum Mali*. This list of injurious insects, which find most favorable conditions for development in the mismanaged forest and threaten the orchard, vineyard, park and plantation, could no doubt be largely extended.

It would be difficult to tell what in amount the loss from these borers may be. We have learned that insect ravages entail the loss of millions. Thus the loss from the Cotton worm was estimated in one year at almost \$30,000,000. And when we consider that the tree-borer does not destroy the year's crop only, but the crop-bearing tree itself, the accumulation of many year's growth and all the labor spent on it, we may readily see that, in proportion to the extent of orchards and vineyards, the loss must be considerable.

We have here another illustration that all things in nature have their relation, and that if we interfere with their adjustment we are sure to throw them out of balance and suffer accordingly. We have another lesson which teaches that cultural and forest conditions are closely related to each other, and that, as we disregard proper forest management in utilizing nature's gifts, we must bear the consequences in other directions.

FORESTRY AT THE DOMINION EXPERIMENTAL FARMS.

The Experimental Farm System has only been in operation a little more than three years, including the work of organization. The Farms are five in number, at Nappan, N. S., the central one at Ottawa (whence the Reports of the others are disseminated in the same manner as those of the Agricultural Experimental Stations of the United States), at Brandon, Man., at Indian Head, N. W. T., and at Agassiz, B. C. Brandon and Indian Head have each a section of land; Agassiz and Nappan each three hundred acres; while the Ottawa farm, serving for Ontario and Quebec, has four hundred and sixty-seven acres.

The central farm began its operations in the spring of 1887; Nappan, Brandon and Indian Head following in 1888; while Agassiz was not organized till 1889.

With such an expanse of territory, the needs are exceedingly varied, and therefore the range of useful knowledge to be obtained is much widened. So far it has been the aim of the management of the central farm to supply such trees as are in the judgment of competent men best suited to the conditions of soil and climate at these different points. Reliable reports from the superintendents of the branch farms will facilitate the speedy introduction of suitable trees to the different portions of the Dominion, *especially* to the wind-swept prairie regions of Manitoba and the northwest.

One of the permanent features in forestry on the farm at Ottawa is the planting of a belt of trees on the north and west sides, made up of different varieties grouped in blocks for comparison. Many of these clumps are planted in irregular forms, so arranged as to overlap each other, which overcomes the stiff appearance given by planting in squares. The belt is about one hundred and fifty feet wide; the first ten rows on the west being five feet apart, and the rest ten feet apart each way. This has been done to ascertain the relative advantage of close or wide planting. Careful records of the age at planting, the annual growth thereafter, and other necessary particulars are taken, and will be reported as soon as practicable. There are in this belt about eight thousand trees, made up of the following varieties: conifers; Scotch pine, white pine, Riga pine, Austrian pine, Norway, white and blue spruce, hemlock, arbor vitæ, European and American larch; deciduous trees; red, white and burr oak, sugar maple, soft maple, Norway,

red and Negurdo maple, white, yellow and canoe birch, white elm from Manitoba, native white and red elm (*u. fulva*), Rock elms (*u. racemosa*), black ash (*f. sambucifolia*), green (*f. viridis*), red (*f. pubescens*), white (*f. Americana*), European ash (*f. excelsior*), black walnut, butternut, European alder, hickory, Lees catalpa, Japan catalpa (*e. Kämpferi*), hardy catalpa (*c. speciosa*), Russian mulberry, yellow locust, honey locust, black cherry, European and American mountain ash, sycamore, beech and horse chestnut.

Thus far it is premature to speak of results, yet failure in some cases is so emphatic as to force conclusions: for instance, the catalpas, *speciosa* not excepted, appear to be worthless, and will certainly never make timber trees in the vicinity of Ottawa. Russian mulberry, honey locust and American sycamore suffer slightly. Black walnut promises to succeed, and we have trees three years from seed six to seven feet in height. Negurdo maple, Russian mulberry and yellow locust are about equally rapid growers, and lead all others in the belt, though for economic value I think with Prof. Lazenby that there are few trees equal to the white ash.

Besides this belt another is planted with the above varieties and a number of hardy shrubs. Here the varieties are planted in rows to admit of cultivation, but indiscriminately mingled somewhat after forest conditions, and will afford experience from another aspect. One of the initiatory steps at the central farm was to obtain a liberal collection of the seeds of Rocky Mountain and European conifers, and as a product from these seeds we transplanted from seed beds last Spring about 175,000 plants or young seedlings, made up of Riga, Scotch, Austrian, stone and ponderosa, or yellow, pine, Douglas, blue, Norway and white spruce. These will be distributed, when of proper size, to the branch farms and other experimenters, who will give us careful returns. Our stock was also increased by importations of seedling deciduous and coniferous trees from Europe, which are being distributed to those points which seem best adapted to their culture.

In order to encourage tree-growing in the northwest territories, the Minister of Agriculture caused to be distributed free from the central farm to voluntary applicants last spring, 100,000 forest tree seedlings, one hundred trees going to each individual, together with instructions for planting and after-care. It will be seen by this arrangement that provisions were made for one thousand packages. The applications exceeded the supply by fifteen hundred, showing that there was no lack of interest. Each pack-

age was made up in varying quantities of the following varieties : white ash, green ash, box elder, soft maple, hard maple, white elm, honey locust, black locust, black walnut, butternut, Russian mulberry, black cherry, cottonwood, sycamore, linden, Kentucky coffee tree, red cedar and wild olive (*Elcagnus angustifolia*). This distribution covered a very wide territory, and the results cannot fail to be valuable. In addition to this, the C. P. R. gardens, twenty-five in number, situated along the main line west of Winnipeg, have been supplied the past two years by collections of trees from the Ottawa farm, and it is upon these trees that the results as given in the telegram read by Mr. Joly last night are obtained. The Indian and police stations, in the far north and west, have for the past two years received liberal collections of the hardier trees and shrubs from the farm at Ottawa, with such suggestions for their care and culture as their particular locations seemed to demand.

Arrangements are being made to continue the work of distribution on a larger scale the coming year, and it is hoped that this slight inducement will enable and encourage settlers in the colder parts of Canada to select such varieties as are best adapted to their conditions, and assist in establishing a limited culture of fruits in sections now deemed unsuitable.

An important point, very often overlooked by northern planters, is the careful selection of the hardiest forms of each species. This is well illustrated in the difference between the Ohio box elder and that grown at Winnipeg. While the former is not as hardy at Ottawa as catalpa, the latter is one of a few trees that came through uninjured at Indian Head, N. W. T., last winter, some of the others being Manitoba elm, Siberian pea tree (*Caragana arborescens*), and the so-called Russian wild olive (*Elcagnus angustifolia*). The same is true, though in a less marked degree, of the Manitoba ash and elm, as compared with the same botanical species here. While our common form was injured at Indian Head, the native of Manitoba came through in good condition. The black walnut of Minnesota and Dakota, and Kentucky coffee tree of central and northern Iowa, are essentially hardier than their southern relatives, and it should be our aim in this region to obtain seeds from trees at the northern limits of their native habitats.

FORESTRY ON THE WESTERN PLAINS OF CANADA.

By WM. SAUNDERS, DIRECTOR OF EXPERIMENTAL FARMS,
OTTAWA.

Experiments in tree planting were begun at all five government farms as soon as possible after they were located, but on those in Manitoba and the North-West Territories this work has been conducted on a more extensive scale than elsewhere, as the need of forest shelter is much more keenly felt in the prairie districts. Work was begun on the farm at Indian Head, N. W. T., during the summer of 1887, and the first trees were planted in the spring of 1888, about 20,000 in all, consisting of a large number of varieties. This farm is a section of bare prairie land of 680 acres without any shelter whatever. In the spring of 1889 another consignment of about 12,000 was forwarded, and during the present season a few thousand more have been sent. A considerable quantity of seed of the box elder, with a smaller proportion of white ash and American elm has been sown each season, and thus more than 50,000 seedlings have been added to the stock. A portion of these seedlings have been distributed among the settlers in the neighborhood of the farm, but the larger part has been planted in shelter belts and forest clumps on the farm.

The Brandon, Man., farm was selected during the summer of 1888, and tree planting was begun there in the spring of 1889. About 20,000 trees were sent that year and ten or twelve thousand more in 1890. A large number of seedlings of box elder, ash, and elm have also been grown there during both these seasons. The Brandon farm is situated partly in the valley of the Assiniboine River and partly on the bluffs which form the northern boundary of that valley. This farm is mostly prairie, but in the ravines in the bluffs, and also on the face of the bluffs there are large patches of scrub, consisting of scrub oak, hazel, elæagnus and other low bushes, while near the river bank there is a small grove of elm, ash, and box elder trees, with undergrowth of willow, rose, etc. The land on these two farms is varied as to exposure, while the soil and the climatic conditions by which they are surrounded are such as to involve most of the difficulties which stand in the way of tree growing in the better farming districts in the Canadian Northwest.

During the spring of 1889, many packages of trees were sent to different parts of the Northwest plains for test, and this work has been continued on a larger scale during the past season. The distribution outside of the experimental farms in 1890 consisted of 130,000 seedling trees of one and two years' growth, which were sent by mail in 1300 packages of 100 each to as many different points, while larger bundles were forwarded by express to twenty-five of the experimental gardens on the line of the Canadian Pacific Railway from Moose Jaw to Calgary, to most of the agencies on the Indian Reserves, and the chief stations of the mounted police. By these several methods, trees have been distributed for test over the whole area from the eastern part of Manitoba to the western extremity of the great plains of the Territories and along the foothills of the Rocky Mountains. On the Indian Head farm trees have had the test of two winters and three summers; on the Brandon Farm and at a few other points, including about twenty stations on the Canadian Pacific Railway, we have the results of one winter and two summers; while at a very large number of other points the summer draught and heat is the only test the trees have yet been subject to. This latter, however, is no mean test, for dry weather will often cause the death of more trees than will the cold weather of winter.

The results of the tests on the experimental farms have been carefully noted each year, but the experience gained is too limited as yet to admit of very positive statements regarding many varieties of trees under trial. The following notes may be of some interest.

Box elder, *Negundo aceroides*.—This tree promises to be the most valuable of all forest trees for the Western Plains, adapting itself to all conditions of climate and situation, and making thrifty growth under trying circumstances. No tree is so universally successful, but to get the best results the seedlings should be grown from seed collected from trees growing on the river banks in Manitoba or the Territories. If grown from Eastern seed the young trees are often partly winter-killed. In three or four years from the time of sowing the seed, this tree will usually attain a height of from five to seven feet, with a nice bushy head, and after that the growth is quite rapid.

Among the trees which promise to rank next in value are the American elm and white ash, when grown from Manitoba seed, but these often prove more or less tender when grown from seed

produced in Ontario or the Western States. The native poplars and some of the willows also make fine growth and aid materially in the formation of shelter belts; some of the Russian poplars have also succeeded very well, notably *Populus petrowska*, *certinensis*, *bertolinus* and *bolleana*; *salix laurifolia* is also valuable. The American and European mountain ash, yellow birch, European white birch, and the variety of white birch, known as the *cut-leaved*, have also proved hardy as far as they have been tried. Of the maples, the only ones which have succeed thus far are the silver-leaved, *Acer dasycarpum*, and the Norway maple, *Acer platanoides*, and these are only partially successful. The Siberian maple, *Acer ginnala*, has proven hardy at the Indian Head Farm, but this will rank rather as a shrub than a tree.

Among the evergreens the white spruce, transplanted from the sandy plains near Carberry, Manitoba, or the spruce from the foothills of the Rocky Mountains, succeed best. The Scotch fir and the European mountain pine are also hardy in many places, enduring the low temperatures of the winter better than the drying winds and hot weather of the summer months. The white spruce of the East, Norway spruce, arbor vitæ, Austrian pine, red cedar and European larches have failed in most localities in the Territories, but many of them have survived and made a little growth in some places in Manitoba. The same may be said of the bass-wood, European ash and Russian mulberry. The attempts to grow the sugar and red maples, sycamore, black locust, butternut, black walnut and Western catalpa have so far been unsuccessful.

Among the most valuable shrubs useful for ornamental purposes and as undergrowth, are the several native willows, the wolf willow, *Eleagnus argentea*, the native wild cherry, *Saskatoni*, and hazel, to which may be added the Siberian pea, *Caragana arborescens*, Russian olive, and the several varieties of lilac. The wild rose also serves a similar purpose, and the *Rosa rugosa* from Japan, which has proved hardy and valuable at Indian Head.

By the free use of the trees and shrubs named, effective shelter belts and forest clumps can in a few years be produced on the Northwest plains, which will help to break the force of the winds and give a home-like beauty to the bare prairie. When sufficient time has elapsed to allow of more extended testing, many valuable additions will do doubt be made to the list now given.

MINNESOTA WOODSMEN.

H. B. AYRES, NORTHERN PACIFIC JUNCTION, MINN.

[NOW OF THE FORESTRY DIV., DEPT. OF AGRICULTURE, WASHINGTON, D. C.]

The forest-region of Minnesota has an area of some 39,000 square miles, extending from the Canadian boundary southward to an indefinite border, from the St. Croix river near Rush City, westward, near Princeton, St. Cloud and Alexandria, to within a few miles of Fergus Falls, thence northward near Red Lake Falls to the forty-ninth parallel.

Logging operations have been continuous in this region for more than thirty years. During the season of 1889-90, 1,174,607,000 feet, board measure, of pine log timber were cut within this area. To cut and bank this timber required the work of 14,780 men, classified as follows: 118 superintendents, 150 cruisers, 354 scalers, 472 foremen, 1888 sawyers, 472 sled tenders, 2,596 teamsters, 3,776 swamper, 1888 chain tenders, 994 road monkeys, 472 landing men, 118 blacksmiths, 118 handy men, 472 cooks, 472 cookees, and 472 stable boys. Add to this number of men employed in logging the low estimate of 5,000 men working on ties, piles, poles, and cordwood, we have an army of at least 20,000 men, finding comfortable quarters and good pay, six months of the year, cutting and hauling crude forest-products to market.

Of these men but one class—synonomously called cruisers, explorers, examiners, inspectors, or woodsmen—need necessarily be woodsmen in the full sense of thoroughly knowing the woods. In designing and planning logging operations, the superintendent, especially if he is putting in any considerable amount of timber, needs assistants who know all about lines, corners, topography, timber, roads, and road making, the driving stream, and clearing it, and have a good general knowledge of every work connected with logging. These examine the tracts to be cut, estimate the amount and quality of timber, map the land, showing location of timber, with general topography, lay out roads, locate buildings and landings, and after cutting has commenced see that everything is properly done; that all the marketable timber is taken, that no worthless logs are hauled, that no timber is wasted in cutting, that the logs are being properly landed and correctly marked, stamped and scaled. Where men of this class are employed by land owners, timbering and logging is but part of their work; for they

are to carefully map the land in detail on a scale usually not less than four inches to the mile, showing all topographical features, especially streams, lakes, marshes, hills, the various species of trees, size, condition and amount of each kind, undergrowth, bush, grass, liability to fire and trespass, cost of clearing, cost and extent of drainage, and the grade of each tract according to its desirability for farming purposes.

The life of these men is one of continuous liability to exposure, hardship, and severe physical labor, and requires, besides the best of physical constitutions, mature and independent judgment, with unusual fidelity and discretion.

At work, these men move in parties of from two to six, carrying tent, cooking utensils and provisions on their backs. In summer, a party of four can carry their complete outfit for three weeks' work. Canoeing along the water courses, where available, is a great convenience, and is hailed with delight by all as a desirable change from the tiresome monotony of packing.

Throughout this region is a great lack of sentiment and caution against starting forest fires. Camp fires so often die out without spreading, or spread unseen by the camper, after he has moved away, that habitual carelessness is the rule even among men considered thoughtful.

FORESTS IN THEIR RELATION TO THE PUBLIC HEALTH.

DR. PETER H. BRYCE, TORONTO, SECRETARY ONTARIO BOARD
OF HEALTH.

From the earliest times that the phenomena of climate have been observed, we have abundant evidence that the presence or absence of forests has been remarked as producing influences, which have had their effects upon the salubrity of different localities; and, in the warmer countries of Southern Europe and Asia, the deities of the woods and groves stood in high favor with their devoted worshippers.

The people of more recent centuries, too, have not been blind to the protective influence of forests; but it has, until very recent

years, been difficult for the energetic settlers who have had to hew out for themselves homes from the forest primeval, to view the sturdy forest trees in any other light than that of their natural enemies.

Indeed, it yet seems hard for us, as we visit our frontier settlements and see the small clearances and limited sources of income which the settler possesses, not to sympathise with him in his struggle for existence, and to view with calm indifference the wanton destruction of the woods, which in older settled portions of the continent, are coming to be looked upon with a regard akin to reverence. To most of us the value of our forests, as direct revenue producers, must naturally appeal first, while to many others their indirect value from the influence they exert on agricultural productiveness will appear important; but few, indeed, have carefully considered how far-reaching are the influences which their existence or their non-existence may exert upon the public health. Some few months ago I had the honor to briefly introduce the subject of "The Preservation of our Forests a National Sanitary Need" to the International Conference of State Boards of Health then in session at Nashville, Tenn., at a time when the levees of the Mississippi were in danger, and when in some of the Gulf States, destruction had visited extensive areas of country. The Conference, and notably those delegates from the South-Western States, realizing the importance of the matter, adopted strong resolutions expressing their views and forwarded them to Federal and State authorities, urging the adoption of such legislation as would encourage tree-planting in suitable localities over the continent, and thereby serve to mitigate in some degree that destruction of life and property from floods and cyclones, due in large measure, we believe, to the absence of adequate forests on the head waters of many of our largest rivers, and upon the thousands of miles of prairies popularly spoken of as treeless.

To further show its active interest in the important work of which this meeting is the exponent, the Conference, through its president, has requested me to attend here as its delegate, and lend to those who are engaged in this praiseworthy work the support of our Association, whose members comprise the most active and prominent sanitarians of the various states and provinces on the continent. In the name, therefore, of the International Conference of State Boards, I am present to-day to offer this assembled Congress greeting, and to offer the active support of this conference

of health officers in all measures tending to the abatement, or, at least, the mitigation of those evils which are unfortunately too apparent to all of us.

Engaged some fourteen years ago in lecturing on chemistry and meteorology to the students of the Agricultural College of Ontario, I became greatly interested in the influence on organic vegetable life, of the amounts of rainfall during the months of germination and growth; and being anxious to determine, if possible, the truth of the theoretical teachings of chemical physics, as regards the relationships between soils, trees, and the circum-ambient atmosphere, I made a careful and laborious study of the tables of the Toronto observatory, beginning with 1840, and for purposes of comparison took the semi-decades of 1840-45, 1850-55, 1860-65, 1870-75.

From the tables which were published at the time in a paper read before the Canadian Institute, several results became apparent.

TOTAL SNOW AND RAIN.

1840-44	. . . . .	216.57	inches.
1850-54	. . . . .	164.684	"
1860-64	. . . . .	160.387	"
1870-74	. . . . .	152.62	"

or, between the first and fourth periods there was a total decrease of 63.95 inches, or a yearly difference of 12.79.

The total moisture is divided as follows :

TOTAL RAIN FALL.

1840-44	. . . . .	191.020	inches.
1850-54	. . . . .	137.999	"
1860-64	. . . . .	131.706	"
1870-74	. . . . .	113.150	"

or, between the first and fourth periods there was a total decrease of 77.87 inches, or a yearly difference of 15.35 inches.

TOTAL SNOW FALL (12 inches snow, one inch rain.)

1840-44	. . . . .	322.70	inches.
1850-54	. . . . .	320.10	"
1860-64	. . . . .	344.38	"
1870-74	. . . . .	473.83	"

or, between the first and fourth periods there was a total difference of 151.13 inches, or a yearly increase of 12.59 inches.

These calculations agree exactly with theory. In comparing

the individual quarters of each period, I arrived at the following results: March has remained much the same still; with April is found a decrease of more than $\frac{1}{2}$ inch, a decrease that increases with each month until September, thus:—

		April, May, June,	July, August, September.
1840-44	. . . . .	48.55	68.101
1850-54	. . . . .	40.195	48.625
1860-64	. . . . .	32.742	45.617
1870-74	. . . . .	34.670	35.14

The significance of this unpleasant change must be evident to all. The average temperature of the two months of germination is lower now than it was forty years ago. Thus:—

		March.	April.	May.
1840-44	. . . . .	29.88	42.62	51.22
1850-54	. . . . .	30.24	40.06	50.68
1860-64	. . . . .	29.02	40.80	52.86
1870-74	. . . . .	27.24	40.18	53.36

This undoubted fact causes what is termed a late spring, the period for growth and development of the plant being shorter than formerly. The temperature of May, the first month of real growth, is now warmer than formerly, by an average of nearly two degrees. The growth is thus apparently forced unnaturally to make up for loss in April, but the attempt is rendered futile by an undue dryness, the rainfall in May having been:—

1840-44	. . . . .	15.015	inches
1850-54	. . . . .	13.675	"
1860-64	. . . . .	14.055	"
1870-74	. . . . .	8.640	"

I shall only say here that it is apparent that if the period of germination is made later in Ontario by April becoming colder, and if the month of May is notably hotter and drier, then the normal development of plants is very materially affected, and results in greatly reduced arboricultural returns. It will further be manifest, however, that those causes, whether of damp soil, cold winds or excessive heat, which are inimical to normal or healthy plant growth, may become the conditions favoring the operation of other influences inimical to plant life, such as vegetable parasites, the poisonous effects of the complex organic products of an aerobic bacterial life in imperfectly aerated soils, of insects, etc., etc. I cannot forbear illustrating this point by referring to a

recent paper by Prof. H. Marshall Ward, in the proceedings of the Royal Society, "On Some Relations between Host and Parasite in certain Epidemic Diseases of Plants."

He points out what would seem self-evident, "that a plant may vary within very wide limits of the condition we term health." We may, for instance, having a herbaceous plant growing under a high July temperature with an abundance of solar light, when suddenly the temperature falls, rain sets in and the weather remains cloudy for days. Transpiration through the leaves being almost stopped the plant becomes suffused with water and the movements of the absorbed gases are greatly retarded. Now to realize the effects, we have to recognize that the growth of the plant depends upon a healthy condition of its sap, which contains corpuscles and nutritive fluids, which constitute its circulatory system just as much, and in the same sense, as the blood does in an animal. Prof. Ward further points out that the life and growth of the plant depend upon the absorption and assimilation of food, commonly spoken of as metabolism. What thus goes on in the plant depends upon the fact that the cell protoplasm absorbs oxygen brought to it from the water of the soil and from the air, and this oxygen combines with the various compounds contained in the protoplasm. These bodies are thus broken up while others form new unions. Complicated life movements are thus set up, and heat even is developed by the oxygen taking hold of the carbo-hydrates, as starch and glucose, and by the nitrogen absorbed, certain nitrogenous compounds often called, in medicine, the active principles of a plant, as asparagin, etc., are found. A most interesting fact which finds its parallel in the excessive development of acid compounds in the blood of rheumatics and persons suffering from various other troubles, is found in the excessive formation, out of protoplasm, etc., when a lack of carbo-hydrates occurs in the plants, tissues and sap, of organic acids (such as malic, oxalic, etc.) They are due to incomplete oxidation and their variations in quantity depend greatly on the activity of the metabolic processes and, therefore, on the intensity of respiration.

Remembering that the carbo-hydrates are formed by carbon dioxide and water meeting in the chlorophyll of the leaves and other growing tissues, and that the activity of the chemical changes depends largely upon certain rays of sunlight, we can in some degree comprehend how the conditions, favorable to vigorous plant life, must in a very special sense be the measure of

the resistance which any plant will make to injurious influences. Here, again, we find a parallelism to the resistance which the animal organism offers to malign influences. Housed in dark work-rooms and offices with limited supplies of fresh air or oxygen, we have as a result imperfect assimilation or metabolism going on in the blood and tissues, and so we find that the germs of disease in the shape of vegetable parasites, as diphtheria, obtain an easy victory over debilitated and non-oxidized tissues.

Prof. Ward details at some length how the fungus *Botrytis* develops on many plants, and points out that sunshine is wholly unnecessary to its development, and that dull, damp weather and a saturated atmosphere, so injurious to higher vegetation if prolonged and at a low temperature, are distinctly favorable to the development of these fungi. It has been found further, that the mycelium of the fungus develops a ferment—just, for instance, as the diphtheritic microbe secretes a *leucomaine*, which acts as a poison to the human system—and that the poison possesses the property of swelling and dissolving cellulose, and further seems to kill the protoplasm at the points where the fungus has made its way into the cell-tissues of the plant. The action seems to be associated with the formation by the fungus of oxalic acid, which in excess rapidly destroys protoplasm, and so acting like other acids, causes the leaves of the plant to turn brown. The result is analogous to the effects seen, notably upon evergreens in the neighborhood of brickyards, where, during the burning, sulphurous products are given off, which being oxidized in the atmosphere, exert an acid action on the soft tissues of the growing wood.

Hence we see that whatever makes for normal growth and development in plants tends equally to enable them to resist the attacks of malign influences. We find further admirable examples of this in the wheat-rust, the potato blight, black-knot, etc., and in the conditions opposing or favoring their development.

We now naturally must turn and inquire whether we have any analogous conditions which affect climate unfavorably as regards the health of man, and if so, whether the same laws with regard to increased liability to disease become operative. Let us examine these physical influences and effects, which all will agree are largely the result of deforesting. We are accustomed to the use of the terms, (a) *equable, limited*, and *insular*, as applied to climates with slight yearly and diurnal variations; and (b) to *extreme, excessive*, and *continental*, *i. e.*, as applied to climates with great vari-

ations. As producing these we speak of proximity to extensive water surfaces, height above sea-level, etc. In addition to these classes and others, such as latitude, nature of the soil, etc., we recognize that the covering of the soil plays an important function. Herbage, as remarked by the latter Dr. Parkes, is always healthy, but trees play by far the most important part of any kind of vegetation : (a) By keeping the ground cool through directly obstructing the sun's rays. (b) By presenting in their leaves an immense evaporating surface : (c) By this means taking up through the roots an enormous amount of water, thereby preventing a stagnation of ground water, and aiding healthy nitrification processes by the constant introduction of oxygen into the soil : (d) By thereby creating a moist and cool atmosphere around the tree through evaporation, while the same process prevents rapid chilling of the soil by radiation, and at the same time, by the circulation of the sap, a rapid chilling of the tender, exposed parts of the tree is obviated.

We thus have, through the beneficent agency of trees, an equality of climate, obtained in no other way, and in so far as this is a factor favorable to health, we have a distinct advantage to be gained by the preservation of trees.

On the other side, where forests are absent, the excessively rapid changes in temperature, induced by rapid radiation of the earth's heat, affect most unfavorably those exposed to this rapid chilling, and who may not have such strength and vigor of constitution, as to resist its effects. The rapid abstraction of body heat is as inimical to the health of man as of plants, and leaves persons exposed to specific causes, which, under more favorable conditions, are inoperative. Associate with these extreme daily-ranges of temperature, frequent extremes of weather, as of winds and storms, and we have exactly those physical conditions productive of internal congestions, inducing in some form or other, those diseases which hold so prominent a place in our mortality tables. Take but one disease, the causation of which has been long in dispute. Surgeon Major Oldham, of the Indian Medical Service, insists that malaria is due to cold. Logan, in a work on the climate of Chili, tells us that malaria prevails on the table lands, while the lower levels are free from it.

So much then on this part of the influence of trees in preventing a rapid and extreme chilling of the soil and of the atmosphere contiguous to it.

Speaking in the more exact language of to-day, I would say that

these gentlemen ascribe to the moisture and cold a condition whereby a cause is given an opportunity of becoming operative by their depressing influences. In other words, the monad, the cause of malaria having entered the system becomes capable under these conditions, of multiplying and overcoming the resistance of the body, just as *Botrytis*, under similar conditions, grows in plants.

Their influence in preventing these rapid and extreme changes, applies likewise in the matter of forests lessening the changeability and violence of the wind.

Dr. Charles Smart, Acting Surgeon General of the United States army, made some careful experiments on the laws regulating radiation of heat, and other relations thereto of wind and moisture. He says there are three principal factors going to make up climate in its relations to our animal heat, viz. : (1) The absolute temperature of the air : (2) Its motion : (3) The moisture contained in it. The effects of rapid radiation upon the human system, it is assumed by a large school of etiologists, are so great as to produce disorganization of the nervous mechanism that presides over the temperature of the body, and this upsetting of the heat regulating centre is likely to happen when the body has been subjected, during the day, to extreme solar heats and fatigue, and is exposed after sundown, and in the night to the tropical or sub-tropical chill, which will be severe in proportion to the rapid cooling of the ground, and the amount of vapor condensed in the lower stratum of air.

How notable are the differences in the degrees of radiation of heat from the earth is seen in the statement made by Tyndall in connection with some radiation experiments published in detail several years ago, to the effect that were it not for this invisible gaseous envelope, with its moisture surrounding the earth, it would long ago have radiated its heat to an extent totally destructive to the life of every living organism. All of us are familiar with the old example of how on the desert plains, whose soil may attain a temperature of 150° or more during the day, radiation produces, after sundown, so rapid a cooling as to produce hoar-frost as seen on the blankets of travelers who have laid down to sleep on the sands in the open air.

In the matter of clothing our bodies we find the same laws in operation, and protect ourselves by non-conducting flannel and silk under garments.

It is well to recall what long ago was affirmed, that plagues were

stopped in their progression by forests, while there is indubitable evidence going to show that belts of trees have effectually protected communities against the emanations of malarious marshes.

I now propose to speak of an influence exerted by forests, which, studied to some extent, has from the very nature of the case, been but imperfectly appreciated. I refer to their influence, first upon ground waters, and second, as related thereto, their influences upon the processes of nitrification.

Our literature teems with illustrations of how the never-ceasing and uniform flow of springs celebrated for their curative properties, and presided over by some old-time deity, has been largely decreased by the wanton destruction of the forests which protected their sources; while in Ontario we behold the yearly decreasing volume of the dozen or more splendid rivers, which taking their rise in the central plateau, flow toward some one of the four great lakes, Ontario, Erie, Huron, and Georgian Bay.

Towns and cities have sprung up on every side, and as their needs have increased they have looked for local sources of public water supplies, only to find their local streams uncertain in amount during the later summer months, while their decreased volume has resulted in a relatively increased pollution, which makes their use as a source of public water supply, in many instances, quite out of the question. All will see how serious such a matter becomes in its relations to health. But this evil is much more far-reaching in its effects. Assuming that under ordinary circumstances the amount of water which finds its way into the soil is fifty per cent. of the total annual rainfall, it will be apparent that if in all parts of the Province, the snows, by the irregularities of the winter season, pass away rapidly, as they now frequently do during a thaw, to the streams and rivers without being taken up by the then frozen ground; if further during the spring the heat of the sun causes so rapid a melting of the snow, as to make bare the fields in a few days, and fill the streams to overflowing, there results an incalculable loss to the underground sources of supply, which we are coming to look upon more and more as reservoirs, never-failing in their abundance and perfect purity. What such losses mean may perhaps be appreciated when I say that, assuming that six inches of the twenty-five or thirty inches of annual rainfall are lost by deforesting, we have a direct loss to our underground sources of supply amounting to nearly 100,000,000 gallons per square mile of surface. What this loss means to a city which has to look to

driven-wells for its supply will readily be understood, since the more extended that the necessary gathering ground becomes the more expensive does the matter become to the city, whose demands are constantly increasing. Curious as it may appear we see on every side two constantly attendant phenomena, yearly and increasing needs of pure and sufficient water for our cities, and yearly decreasing supplies as regards both purity and quantity. Remembering that it is commonly agreed that more than eighty per cent. of all our typhoid fever is produced through the medium of drinking water; that some 700 deaths and more than 10,000 cases occur in Ontario yearly, causing a loss of labor, of more than 300,000 days, and at least as much more unproductive expenditure of capital, we can understand how from the health standpoint alone deforesting has an economic importance, well-worthy of our most serious consideration. The matter of the loss to the soil produced by the sudden disappearance of the water resulting from the melting snows, and the equally useless and even destructive effects of the torrents which are poured upon the baked and arid surfaces of our fields, by the thunder storms of summer, have another and far-reaching influence in the matter of the retention and utilization of the organic matters of the soil. The vegetable organic matters of our virgin soils, the manures which are deposited on our agricultural lands, depend alike for their beneficial effects, upon whether they are quickly utilized by being converted through the action of the bacteria of the soil into compounds assimilable by plants. Now, upon the aeration and upon the moisture of the soil will depend the rapidity and perfection of the nitrification process. All are aware of how manured or meadow lands often seem to be productive of but little results during a dry summer, and again of how a soil cold and unaerated is equally barren of results. We recognize the reasons of this as two-fold: first, a lack of drainage, whereby the water of the subsoil is prevented from being removed in such a manner as to allow of *aeration* of the soil, and second, from a lack of warmth of soil whereby the bacteria are able to multiply rapidly. A soil left dry after the floods bakes and becomes impervious to air; while its cold subsoil may be so clogged with water, that the bacterial action which goes on is productive only of those compounds which produced by microbes multiplying in the absence of oxygen, are positively injurious to plant-life. Now, when we refer to the effects of forests upon the soil we find that, while they enable the water entangled in the in-

terstices of the leaf-mould and humus, to pass silently into the earth, protected against the scorching rays of the sun, they likewise act in the most positive manner as drains to large areas of surrounding soil. Their taproots running downward often pierce retentive clays, and the organic decomposition which goes on in the root fibres creates innumerable drains by means of which sub-soil waters are lowered to a notable degree. How great this drainage becomes may be measured by the amount of water which is evaporated by a tree. Parkes and others have given us figures showing an evaporation from the leaves of a tree as equal to two and a half gallons daily, or as given by another equalling two hundred and twelve inches of an annual rainfall. This evaporation may be best comprehended by imagining it to be at least equal to one foot of water from a surface equal to fifteen feet square.

This removal of ground water, viewed from the public health standpoint, is most important. By drainage or a lowering of the ground water, Dr. Buchanan, president of the Local Government Board of England, has shown that in a few years, the death-rate from consumption in drained towns was reduced nearly fifty per cent.; while everyone is familiar with the story of how, at a Trappist monastery situated on the Roman Campagna, eucalyptus trees planted about it caused a disappearance of malaria from all the inmates except those whose rooms looked upon a damp inner court. This phenomenon being observed, several eucalyptus trees were planted in the court, when through the drying of the soil by their roots, and a utilizing of the products of normal decomposition of the soil, those conditions favorable to the development of the malarial poison in the soil were removed and the disease disappeared.

Those direct influences upon the public health, resulting from floods and cyclones, are patent to all. If there ever were a year when our legislators, our scientists, the people generally have been made aware of how nature, "*red in tooth and claw*," avenges herself on those who despise her teachings, it is the year of grace 1890. I had intended to have made a table showing the disasters from these causes, as collated from the reports of the daily press, but I have forborne. It would have recalled horrors useful only so far as they teach us lessons. Modern science is striving with much success to chain every force of nature to the car of human progress, but it would seem as if the father of the gods resents the violation of nature's laws and this destruction of her sylvan fanes, while the

stealing of the fire of the gods by a modern Prometheus results as of old only in the punishment of man. *Sic itur ad astra* seems ever to have as its refrain *facilis descensus Averno*, and to balance the evil and good between these, the lumberman and agriculturist who would subdue the earth, and those as the sanitarian, the engineer and poet who would maintain inviolate nature's gifts in the trees, is equally the aim and we trust the attainable ideal of such meetings as this.

FOREST PRESERVATION AND RESTORATION.

J. C. CHAPAIS.

In Canada some boldness is needed to speak of forest preservation and restoration. To the settler who has yet his axe in hand to fell the trees growing on the piece of land he intends to sow, the tree is still an enemy, and you cannot make him believe that a day may come when he will regret having treated it too long as such. The lumber merchant too, with forest limits apparently inexhaustible, wants to make a fortune as quickly as he can, and turns a deaf ear to economists who try to make him take thought for the coming generation.

Many districts covered with forests thirty years ago, however, contain no more firewood or timber. Very often, even agriculture has not benefitted from a clearing of trees so foolishly made, because it was made on land quite unfit for cultivation when once influence of the ashes of the wood burnt during the clearing is exhausted. I know whole regions which were cleared in that way by settlers who had to desert the land soon after, because it was worth nothing. Such districts would have been inexhaustible wood-reserves for future generations, who during an almost endless period would have found on them all the wood they wanted. To-day these same districts are quite useless in every respect.

If we wish to be listened to by the farmer, who is always prejudiced against ideas quite new to him, we must for the present speak only of what is the least apt to run counter to his prejudices. Measures not hostile to his supposed interests must first be at-

tempted. We should request our governments to direct the land surveyors, when fixing the boundaries of the new townships opened every year to colonization, to point out with precision in their reports the regions unfit for agriculture, in order that they may not be granted for that purpose.

Let us further urge that the wood-reserves thus created, as well as the forest limits rented for the manufacture of timber, be protected against the systematic and complete devastation to which they are subjected by too greedy limit owners, and against fire. Forests can be protected against such devastation by adopting and enforcing rules to prevent the useless destruction of young trees and the ill-timed felling of trees not full grown. As to protection against fire, the most effectual would be to compel woodsmen to free the land from boughs, chips, shavings, branches, and other wastage, which tend greatly to increase the number of bush fires. I know that this will be called impossible, especially by woodsmen, but what woodsmen of other countries can do, is possible for ours.

As to replanting in places where the forest has been destroyed blindly, it is still more difficult to interest the farmer in it than in forest preservation and protection. His forestry education is yet too superficial to make him apt to understand that it is not only a benefit, but a necessity to replant in denuded regions. In vain we mention the fact that there are foreign countries where, by the complete clearing of mountain slopes, fearful periodical floods are caused, which necessitate banking up the towns situated on the rivers (like the Loire for instance) taking their rise on these slopes, to prevent them from being overflowed. We may even point out the same occurrence in our own country, that the St. Lawrence is now subject to much more severe floods than it was formerly, and that we see to-day the town of Montreal protected by a dike, the same as the towns of France; and that for us this is only the beginning. But all this is insufficient to convince the farmer that replanting is necessary.

Nevertheless replanting is necessary, but as the farmer objects to planting trees, the shade of which we will not enjoy, there is happily another way of restoring forests. Almost always in the regions deprived of wood it is an easy matter to bring the land to produce by itself a good growth of trees. It is what I would call the natural restoration of forests, and to quote what I wrote on this subject six years ago in my book, *The Canadian Forester's Illustrated Guide* :

“ Extensive districts, long cleared of their forest growth, frequently cover themselves again with wood, if care is taken to aid nature in her operations. Generally speaking, plains and damp marshes, where a few wretched stunted trees show themselves here and there, are susceptible of this treatment. Drainage, by means of deep open ditches, of sufficient frequency to admit of the tree growing, if not of perfectly drying the land, is the only thing necessary. The moment that this has been done a multitude of little trees will spring up, which were only waiting for this amelioration to show themselves, and the new growth is usually so prolific and so rapid that we should be inclined to call it spontaneous, did we not know how long seeds would lie dormant in the ground, until all things necessary for their growth were present. The same thing occurs on certain hill-sides, where, protection being afforded against the teeth and hoofs of cattle, their hoary heads soon become crowned with a wreath of luxuriant verdure.”

I must state that to-day this natural restoration is well understood by our farmers, and I can prove it by an example. The tourist who travels by the Inter-colonial Railway from Quebec down to Rimouski, in the Province of Quebec, goes through a region of one hundred and eighty miles, which forty years ago was for the greatest part in forest. This forest has been felled, burnt, and has made place for numerous settlements. But the land forming the slope of the mountain range, at the bottom of which runs the railroad, having been found unfit for cultivation, has been left by itself to make a second growth of wood. The new trees have been thinned, well taken care of, kept uninjured from the teeth and feet of animals, and now, from Quebec to Rimouski, you will see fine maple bushes grown on the land once wrongfully deprived of its trees by the old settlers.

WHAT CAUSES THE CYCLONES.

MRS. S. W. DODDS, M. D., ST. LOUIS, MISSOURI.

It is well-known that large bodies of heated air sometimes create atmospheric disturbances ; also, that heat expands air or gases, and that in this rarified state they will rise, and give place to other volumes of gaseous matter. There are many familiar illus-

trations of this. Suppose the air in a room is much warmer than that outside, and there is a long window with its top near the ceiling, and its bottom near the floor. If we slip the sashes a little both at top and bottom, and then hold a lighted candle near the openings, we shall perceive that hot air rises and forces its way out at the top ; and the cold air from outside rushes in at the bottom to take its place.

Now, if instead of a room, we have a vast area of country filled with super-heated air, what will happen ? The hot air will rise as before, passing into the upper strata of the atmosphere, and the cooler air will rush rapidly in to take its place. This, indeed, is just what happens in the torrid zone, both on sea and land ; and also in some parts of the temperate zones, where there are immense deserts, and in these countries tremendous tornadoes or cyclones are common.

Near the equator nature has produced an abundant vegetation ; there are great tropical plants and dense forests ; trees and shrubs with their thick foliage, which intercept the sun's rays and equalize or dissipate the heat. There are also luxuriant grasses covering the surface of the earth, and keeping it relatively cool. But suppose men strip the earth of this covering, cut down the trees, or dig them up root and branch. Suppose they do this over an area of thousands or hundreds of thousands of square miles—what then ? The sun forthwith withers the tender grass, the fragile undergrowth of shrubs, and the clinging vines. The once green earth is laid bare, both on hillside and plain, and when the rains come, the waters will pour down the hills and mountains in torrents, and rush on to the rivers, and by those great arteries to the sea. The gentle showers that came at frequent intervals are now of rare occurrence, and the country suffers from long droughts. Instead of light mists or showers, there are heavy, beating rain-storms, and often great water-spouts ; these accompanied with wind and carrying everything before them. Trees are torn up by the roots, and immense rocks lifted from their foundations.

But the men, meanwhile, are still at work ; they continue to fell the trees, until the very mountain sides are bare. The plains are converted into vast prairie lands. The sun scorches these plains, killing everything that has life. And by and by there are no more rains ; the immense bodies of heated air are of such magnitude, covering such vast areas of country, that a reduction of temperature necessary to condense the moisture and cause rain-falls, can-

not be produced ; the right conditions are no longer present. In other words, the once fertile land has been converted into a desert.

This is what has actually come to pass in certain countries. A popular writer of our own times has shown conclusively that many—if not most of the great deserts in the world—have been made by man, and in the way already stated. This writer shows that the work is still going on, and that unless we can stop it, vast saharas or barren wastes will take the place of the once fertile fields. He thinks, too, that our so-called great American desert was produced in this way, and that there are forces now at work, which, if unchecked, will convert large portions of our country into desert tracts.

Take the State of Ohio for illustration. Thirty or forty years ago it had a magnificent timber land, beautiful forests, even in the more thickly inhabited portions. Some of these forests, it is true, had been cleared away to make room for farms ; but there was still plenty of timber left, to say nothing of the orchards, ornamental trees and other shrubbery about the dwellings. Great changes have taken place in Ohio ; her beautiful forests are nearly all gone, at least in the middle and southern portions of the State. Instead of thick groves here and there, the little fringes of timber are so thin and vapory, that they are as nothing, comparatively speaking. As one passes through on the railway, even these meagre strips of timber recede farther and farther from sight, and we realize the fact that the once beautifully wooded State of Ohio has been, in a great measure, transformed into one vast prairie.

What is true of Ohio, is to a large extent, true of many of the other States. The forests have been cut off too closely, and the climate of the whole country has been changed. The April showers are now the exception, and either beating rain-storms or long-continued droughts are the rule. And when the down-pour comes in the spring time, there are neither trees nor undergrowth to absorb the water, it rolls down the bare hill-sides and slopes into the rivers, and great damage to fields and farm lands, towns and cities, must necessarily follow, from extensive inundations.

Have we no connection here between cause and effect? The reasoning, it seems to me, is plain, and the sooner we make a note of the facts in the case the better it will be for us and for those that must follow after us. Unless some preventive measures are taken, the storms will continue and increase in severity. The great bodies of heated air that arise from the surface of twenty different

States, are disturbing the electric and other conditions of the atmosphere, and essentially changing our climate. Even the states that are not yet so closely stripped of their timber suffer more or less from the general conditions. The snows of winter are becoming practically things of the past, and the genial showers are few and far between. The scorching droughts are prevalent, and the shortness or failure of crops is in proportion.

I used to wonder what made the great prairies in Illinois and Iowa. It never occurred to me that a former race of people had probably done for these States just what we are doing to-day in Ohio, Indiana, Pennsylvania, New York, Kentucky, the Carolinas, and many other States. And as I listened to the birds in my childhood, I little thought that in a few decades the birds and forest trees would alike disappear, while swarms of insects (which the birds would have eaten) almost take possession of our land, eating up the crops. Have we not ourselves to blame? We have, to a great extent, stripped the country of its trees, and without trees we shall find few birds, while the insects will be left, and if these pests are plentiful the crops will be destroyed. Ohio, once a fine fruit country, can scarcely produce apples, the curculio takes them, and also the plums. Even the small fruits are cut off by the frequent droughts. The same is true of many other states.

Four years ago I was on the Pacific coast. The destruction of timber is going on there. The hills around the beautiful lake Tahoe being already nearly bare. This, indeed, is a burning shame! In all that country the pines are fast disappearing. The lumbermen are shipping them to distant points, and the green hills will soon be almost as destitute of tree-life as the plains of Colorado. The birds are going with the rest; in fact, every loafer or boy that can carry a gun is after them. There will most assuredly be a sequel to all this; even now, in that distant coast country, so noted for its fine climate, the storms are finding their way. Why not? Like causes must produce like effects.

What, then, is the remedy? Shall we wait to find it till the storms become hurricanes, and the high winds tornadoes, each as frequent as in the torrid zones? We hear a good deal about irrigation. Given water, it is said, and the desert can be made to bloom. Very true; but we had better have kept the water when we had it and with it the trees, the foliage, the birds, the crops. Whether we can bring them back is a serious question. We may find it a long way to travel back to the right road, but we might,

at least, search it out. The trouble, I fear, is that we are not looking for it. But the time is near at hand when we shall be forced to seek it; to do what England has done; Germany, France, and other European countries. We must replace our trees, enough of them to modify our climate to a certain extent. If we once begin we may save a great part of this country from becoming, sooner or later, hopelessly barren, and mitigate the fearful and destructive storms, which are already a terror to the people; but we must begin in time.

THE PRESERVATION OF SMALL FORESTS.

DR. N. H. EGGLESTON, OF THE U. S. FORESTRY DIVISION,
WASHINGTON, D. C.

The greatest obstacle in the way of securing efficient action for the preservation of the public timber lands arises from the lack of personal interest in the work. The public forests are spread over a wide territory; their character and condition are only partially known to the mass of those living near them, while the bulk of the people, resident at a great distance, know hardly anything about them and feel little interest in them. They do not see what benefit their preservation will be, or what loss, if any, they are likely to suffer from their destruction.

In the case of private forests there is, of course, no lack of personal interest. But the difficulty here is that the interest is so limited in duration that there is no adequate motive for proper forest management, while the limited extent of individual holdings usually prevents any such continuity of woodlands as will secure the best forest results. Our system of land tenure and the habits of the people are such that any parcel of land may pass into the possession of a new owner at any time. The prospect of pecuniary gain or saving, however temporary, is enough usually to occasion the transfer of land from one to another, and most land-owners in this country hold their lands in the consciousness of such uncertain and limited tenure. Of course the motive for planting or properly caring for woodland is correspondingly weak. Then also the length of time requisite to bring trees to their

maturity discourages effort or outlay in planting or managing forests. What advantage can a man, with his limited and uncertain tenure of life, hope to gain from planting forest trees or cultivating most effectively his partly grown woodland, when a century or two is needed to bring his trees to their harvest time? He stands dismayed before the slow-rounding cycles of the oak or the pine. With a system of entails it would be different, for one would feel that though his own life might soon come to an end, his efforts and expenditure on his estate would not be wasted, but would accrue to the benefit of his children and children's children.

What our country needs, therefore, for the most successful dealing with forests, is a personality whose life is as lasting as that of the trees themselves. The Nation is such a personality, and hence the Nation or State can care for the forests in the best manner and use them to the greatest advantage and with the highest profit in all respects, as is seen by the forest management of European countries. The same is true of counties, towns, parishes and precincts, as well as private corporations. They can properly undertake any enterprise, no matter how much time it may require for its accomplishment. To such an unlimited life, to grow a forest, even of sequoias, is no more than for an ordinary person to grow a crop of corn.

Why may we not avail ourselves of this larger, longer life for the establishment of forests, if not on as large a scale as we would like, yet so as to secure very desirable advantages? Why may we not have something like the communal forests so frequent in Europe? While encouraging every farmer and land-owner to preserve a due portion of his existing woodland and to plant shelter-belts at least, why may not our counties and towns as such establish and maintain forests? In many of our counties and in many of our towns there are tracts of land, sometimes of large extent, often comparatively small, but many in number, which are unfit for ordinary cultivation, because they are stony, or swampy and not easily drained, or lie on steep hillsides. As they are now, they do not yield more than enough to pay the taxes assessed upon them. But while thus unprofitable in their present condition they could all be profitably used for the growth of forests. There is no land where trees will not grow, and there is no crop which can be grown so cheaply as a forest. Why should not the county or town utilize such tracts, by taking them out of their present unprofitable condition and devoting them to a remunerative

forest growth? Such tracts would often be given to the town or the county : in any case they could be bought at a very low price. Where there are several small patches of woodland, or lands partly wooded, but separated from one another, there would be a marked advantage over the existing condition of things. These small patches, if wooded at all, are of value now only for their small yield of fuel and inferior timber. If they were in the possession of the county or town they could be combined, the necessary connecting land also being taken, so as to form such a continuous stretch of woodland as to possess more or less of the qualities of a forest, exerting climatic and other influences. Such an extent of woodland would also warrant better management and be more productive than smaller parcels. From time to time also the town or county could extend this forest area by gift or by purchase, as the private person adds to his land, and as is done, in the case of their larger forests, by the European States.

Another advantage gained by the town or county forest system would be their protection of such forests from fire and other injury as no strictly private forest or forests belonging to the general government would be ; for the whole community would have an interest in watching them as their own property, and if fire should by any chance break out, every one would be prompt to help in extinguishing it.

Such forests could be cared for and maintained at a minimum of expense and a maximum of profit. This would be as the result of the general law, that a large business is more economically managed than a small one. The proprietor in this case, the town or county, or trustees or other corporate person, would always be able to command the requisite labor at the proper time. The work would be done under no such stress for immediate results as often urges the private land-owner ; therefore the work would be done the more cheaply. If an existing woodland or several tracts were thus taken in hand, the clearing of the rubbish and necessary thinning could often be secured with little or no outlay of money.

There can be little doubt that a fair rate of interest on such an investment as this could be secured. Examples of the management of such limited and local forests abroad indicate this very plainly. The forest owned by the city of Zurich, Switzerland, consists of about 2,500 acres, lying on both sides of a stream in a rather narrow valley between high hills, and is nearly five miles in length. It is about an hour's ride from the city. It has long

been managed as a source of revenue with satisfactory results. Last year the net profit was more than \$10.00 per acre. But other considerations besides the mere pecuniary advantage would be taken into account by town or county proprietors. The sanitary influence of such forest reserves would deserve regard. Their influence upon adjacent agricultural lands would also properly be taken into account, and their general climatic effect whenever they were of considerable extent.

Such forests would also incidentally become valuable as experiment stations, where many kinds of trees would be tested on whatever varieties of soil and exposure the grounds might furnish, and thus every landholder around might learn much as to what trees it would be most desirable for him to plant on his own premises.

A nursery would also naturally be a part of the equipment of such a forest, for the purpose of rearing trees to fill the places of those cut from time to time. And this might easily be made a source of revenue, by the sale of young trees to the land-owners of the town or adjacent region.

Finally, such a forest might have a value over and above any of a pecuniary kind, by being made a place of pleasant resort for the whole community, a place of special meetings on various occasions and of healthful recreation at any time. Thus the people would cultivate their forest, and it in turn would cultivate them, developing in them a taste for natural objects, opening their eyes to new beauties and new sources of delight, binding them together in society, and endearing to them their dwelling place more and more with the passing years.

TREE CULTURE AND EXPERIMENTS WITH SOUTHERN TREES IN THE FAR NORTH OF QUEBEC.

AUGUSTE DUPUIS, LES AULNAIES, QUE.

Convinced by what I heard at the meeting of this Association at Montreal, in 1882, that it was the duty of every owner of woodlands to follow the rational suggestions for their management there made, I laid the matter before the L'Islet County Horticultural Society, which decided that the best means to ascertain how the

farmers generally managed their woodlands, was to offer prizes to those who had preserved their woodlands best, or who had the largest area in good timber of new or second growth formed by natural seeding and properly thinned.

Prizes were offered by the Society and private members, and judges named to examine the woodlands of several competitors. The first prize was for sixty-two acres of sugar maple trees, all large enough to be tapped for sugar, all second growth, which had been repeatedly thinned. The first thinning was of no value; the second, third, and fourth thinnings were valuable as firewood and paid for the work. The original growth had been cut down entirely except a few maples left on some stony hills, which served to reseed the land, some of which had been plowed thirty-five years before the visit of the judges.

Three other prizes were given for maple groves of fifty, fifteen, and three and a half acres respectively, similarly managed. It was ascertained that many farmers were following this mode of re-wooding their lands, but the majority neglected the seedlings, which, being too thick, made sickly, slender trees of no value. The prizes attracted the farmers' attention to the subject, and the following years a good many acres were thinned in the fall. I myself thinned thirteen acres in two years, and the trees left have since made an enormous growth.

I have here plants and branches of trees hitherto unknown in the eastern part of the Province of Quebec, grown from seeds procured in the fall of 1884. I made this experiment without expecting any profit therefrom, but only to ascertain the degree of hardiness of each.

In 1887 at the Provincial Exhibition at Quebec, I had fifty-two distinct varieties of trees (seedlings) of the above plantation, for which a diploma was awarded.

Most of the seedlings had grown well and I expected to declare hardy, trees that had hitherto been considered tender in my district and to the south-west. But I was disappointed, the third and fourth year, to find that several kinds thrived and resisted the winter when they grew below the snow level, but the new growth over the snow was entirely frozen in some and partially in others. I will name some of the trees, and you may see by each tree and branch on this table the damage caused by frost. The trees were planted in exposed situations and without protection.

Ailanthus. Not hardy, freezes from the root.

Ash leaved Maple. Very hardy.

- Birch, Cut-leaved European.* As hardy as the American. This very ornamental tree thrives splendidly and is reproduced easily from cuttings.
- Butternut.* This beautiful tree is hardy and seems to grow as quickly here as in Massachusetts.
- Black Walnut.* It has not proved hardy on my sandy soil. The seedlings were destroyed by the freezing of the roots. Ice had formed over the plantation three inches thick and thawed only in spring. The plants had not a fair trial.
- Catalpa.* Not hardy here. I lost the trees after the third year.
- Chestnut.* Doing well and is very ornamental.
- Common Locust (P. Acacia).* This tree, on sandy dry soil, seems hardy, its growth being slow, but at the Manor des Aulnaies, trees twenty years old, which annually bore an abundance of fragrant flowers, were all winter-killed in 1887.
- Golden Willow.* This tree grows rapidly for ten or twenty years, and though looking healthy is suddenly winter-killed. This is what happened to many large trees last winter.
- Honey Locust.* Not hardy. I lost trees (winter-killed) that seemed well protected by a belt of balsams.
- Kentucky Coffee.* Trees seemed hardy until the third year, but part of each year's growth has annually frozen since.
- Kilmarnock and New American Willows.* Hardy, doing well.
- Linden, European.* Hardy like the native, the leaves are smaller.
- Elm, European.* No improvement on the native. Hardy.
- Elm, Cork-barked.* Did not thrive on my dry soil.
- Maple, Silver-leaved.* Hardy rapid grower. Since two years an insect has attacked the leaves, spoiling the appearance of the tree.
- Maple, Red Colchicum.* This rare and beautiful Japanese variety is not hardy : all the growth above the snow level freezes.
- Maple, Sugar.* This native variety transplants with so little success, that I was induced to sow seeds in 1882. I am convinced that a nicer and healthier maple grove can be established by sowing than by transplantation of trees from the forest. These maples, planted in 1882, are now from fifteen to sixteen feet high.
- Norway Spruce.* I was very unsuccessful with a plantation of two hundred and fifty Norway spruce planted in autumn, 1886.
- Magnolia Soulangeana.* The seedlings were from St. Catharines, Ont., and were all winter-killed first year.

Horse Chestnut. This tree was considered very hardy. We see trees seventy-five to eighty years old at S. Jean Port Joli, but last winter many trees fifteen to twenty years old, imported from Rochester, died. Trees from seed of the old trees at S. Jean are very hardy and vigorous.

Oak, White. Very scarce in the forests of this section. The young plants I raised grow very slowly. Several of them transplanted amongst other trees thrive much better.

Oak, Burr, Black, Swamp, Red, Pin, Laurel, Spanish, and Turkey. The branches are from acorns sown in 1884. They have not made much growth since. The soil is not rich, and I do not think it advisable, for the trial of trees to ascertain their hardiness, to enrich the soil too much, which might force a late autumn growth not ripe enough to endure the winter. I see no great advantage in introducing these oaks, as many of them suffered by frost.

Tulip tree. Three years trial is probably not sufficient to pronounce it hardy East of Quebec. Still, I have great hopes in the success of my small plantation, as only the terminal buds were bitten by frost.

SHADE AND ORNAMENTAL TREES FOR CITIES.

GEORGE MOORE, MONTREAL.

The importance of judicious tree planting to the beauty and health of cities needs no argument, and I may therefore proceed to notice, briefly, a few details.

First.—The varieties of trees most suitable for street planting, are the elm, (*Ulmus Americana*), and the maple (*Acer platanoides* or *Norway maple*). Their stately, but compact habit of growth, their wealth of luxuriant foliage, their non-liability, generally speaking, to the ravages of insects, and their freedom from danger caused by the extremes of temperature, are qualities which render them the trees *par excellence* for our purpose. A mixture of both species in the same avenue is not advisable, because uniformity of growth should be aimed at; hence it would be better to plant elms in the main thoroughfares, and maples in the shorter, or narrower ones. Also for the sake of the uniformity so desirable, the planting of trees in the public streets should be

undertaken by the municipal authorities, for, if left to the individual property holders, the result will be unsatisfactory, because one would perhaps plant a willow, and another an ash, or a poplar ; and at unequal distances. In this city, for example, this state of things is much to be deplored. If the Grande Allée could be made of the same width from the Parliament House to the Governor's residence, and planted with elms at equal distances, say sixty feet apart, of the proper quality, what a magnificent drive it would become a few generations hence !

The quality of the young trees to be planted claims our particular attention. These should be nursery-grown seedlings, properly prepared by frequent transplanting and pruning to adapt them to the purpose. It may be objected that nursery-grown trees cannot be obtained, but were they used in preference to those from the forest, the demand would create the supply, and enterprising nurserymen would raise them in large quantities.

In a recent article in the *Quebec Journal of Agriculture*, our Vice-President, Mr. Joly, advises every land-owner to establish a small nursery on his own account in which to raise and cultivate seedlings of such shade and ornamental trees as he might require for his own use. When we consider that every estate is so much improved by good trees, and the advantages of rapid and symmetrical growth which such trees possess over those taken from the forest, we must hail with interest the valuable suggestion.

Great mistakes are made by corporate bodies or their employees, entrusted with public money for the purpose of tree planting, by trying to do the work as cheaply as possible. Economy does not consist in the purchase of unsuitable articles, nor in the employment of inefficient workmen. It is remarkable that these very persons are most particular as to material and execution of all other public works, but when it comes to the delicate and intricate operation of tree planting, in which mistakes are fatal to success, they think it so simple a matter that any tyro can perform it, and therefore set one to work to grub trees out of the forest and plant them without regard to the proper method ; the inevitable result being failure, loss of money, and what is almost more serious, loss of time.

Trees dug from the forest must have their large roots severed for the purpose of removal, and are therefore very liable to fail under the ordeal, besides which they are one-sided and ill-shaped from having grown in too close proximity to other trees. They are therefore a long time, supposing they survive, in becoming

ornamental ; being, if small, like whip-stocks, or, if large, having been stripped of their branches to bring them into shape, like miniature telegraph poles, and surely our cities are already sufficiently disfigured with these. On the other hand, properly cultivated trees are well furnished with fibrous roots, which render their successful transplanting by skilful hands almost a certainty ; and their branches are so arranged by judicious pruning as to make them beautiful objects as soon as they begin to develop their foliage, the very first season. The first cost of such trees is considerable in proportion to the others, as the nurseryman must be paid for the necessary labor, knowledge, and time to produce them, but eventually the outlay will not be greater, and even a saving may be effected, for it is more than probable that the forest trees will have to be replaced several times before any will succeed.

Cheap labor in this respect is usually the dearest. Properly qualified and careful men alone should be employed, and those under the superintendence of a competent and responsible foreman, who will see that the holes are dug with a due regard to the spreading of the roots, and of a sufficient size and depth ; which in street tree planting should be larger than under ordinary circumstances ; not less than four feet square and three feet deep. The gravel, or poor soil of which streets are generally composed, having been removed, the hole should be filled with partially decayed sods and a little well-rotted manure to give the plant a good start and insure vigorous and rapid growth.

A writer in the *Montreal Witness* lately suggested that gratings should be placed round trees in cities, so as not to impede the sidewalk ; to admit air and water to the roots, and which could occasionally be removed and the earth loosened ; this is unquestionably a good suggestion, for as the writer remarks, concrete and paving stones prevent the roots from being duly aerated and moistened ; processes necessary to the rapid and healthy growth of a tree. There has been much controversy as to the proper season of planting, but practical arboriculturists are now pretty well agreed that spring is the best, especially in this northern climate.

Though trees of moderate size are transplanted with the greatest safety, the necessities of the case demand that those for street planting should be larger than for ordinary purposes, being more exposed to danger of injury from various causes. They should be at least one inch and a half in diameter of the stem, which should be not less than eight feet high up to the first branches. They must be stout and stocky, which they will be if they have

received careful attention, and been twice or thrice transplanted before leaving the nursery.

The distance at which trees are planted from each other must be regulated by circumstances. Elms in broad avenues should not be less than sixty feet apart, but maples may be a little closer. The shade should not be too dense, and a free circulation of air should be allowed around each tree when grown. Then each will be a specimen of symmetry and beauty in itself, and form a more elegant component part of the whole avenue.

It is most important that pruning should be done annually for the first few years at least, if the tree is to assume the desired perfection of shape, or become what the English call a "pictorial tree." This should be done by competent persons only, whose practical knowledge and judgment will guide them as to which branches to remove, and which to retain, to accomplish the end in view. If trees are allowed to go for years unattended to as to pruning, they can never be made so handsome, and are besides very much injured by the cutting away of too large branches.

Science points to the fact that when the sap is in the best condition to effect the healing of the wound quickly, is the proper time to prune, and this is in the early summer as soon as the young leaves expand.


Boxes, to protect from injury, and to keep them in their places, should be put around every tree; these should be of a plain, but artistic design, and painted dark brown, as best assimilating with the color of the trunk, and harmonizing with that of the foliage.

In every city, by-laws should be enacted for the care and protection of their shade trees, and no vandal should be allowed to cut and hack them in the manner too frequently done. A properly qualified and duly appointed officer, with full authority to arrest depredators, should have all the shade and ornamental trees under his charge, and if absolute necessity arises for the cutting away of any roots or branches, he should be duly notified, and the trees should be touched only under his direction and supervision.

In view of the sanitary advantage to the dwellers in cities, and especially to the working classes, to say nothing of the improved appearance of a place by the formation of parks, and the planting of lines of trees in the leading thoroughfares, it is an urgent necessity that steps be taken to foster and encourage the planting and after-care of trees everywhere, and to impart to the public as much of the knowledge necessary to success as will make the practice popular and conducive to their comfort in so many respects.

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